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The Geographical Journal.

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THE SECOND FRENCH ANTARCTIC EXPEDITION.*

By Dr. J. B. CHARCOT.

In the great effort now being made in common for the conquest of the Antarctic it is pleasant to notice on the one hand the complete accord manifested both by the leaders of expeditions and by the experts who have organized them, and on the other the truly scientific spirit which has animated them. It is to be hoped that the Antarctic campaign will continue to be characterized by such a state of things, which must redound to the advantage of science in general; and I am convinced that in our enlightened age the small amount of distinction which explorers can confer on their respective countries will not be found to suffer for it.

The exploration of the Antarctic has been set going, and the movement ought not to slacken until the conquest—still only just begun—is complete. Captain Scott has just set out once more for the final attack on the South Pole itself, and great expeditions are being talked of in Germany, Norway, and Japan, while the Argentine Republic is maintaining a permanent observatory in the South Orkneys, and means to establish another on the west coast of Graham Land—the site of our winter quarters. Already, in 1908, Sir Ernest Shackleton had achieved the daring and successful exploration which took him within 112 miles of the Pole, when we, on the *Pourquoi Pas?* were putting forth our best efforts—not indeed on a scale to bear comparison with his—in the region south-west of South America; and, thanks to the zeal and industry of my colleagues, were securing results which the learned world has done us the honour to think of value. Profiting by the hospitality offered me by the *Geographical Journal*, I now wish to set forth in its pages a summary of those results, which will, I trust, show

* Royal Geographical Society, December 19, 1910. Map, p. 348.

how important it is to continue the systematic exploration of the whole Antarctic area. But first I should explain the reasons which led me to choose for my field of action a region so inhospitable, often yielding but a poor return to the explorer, and situated at so great a distance from the Pole itself.

While running along a coast line with a trend to the southward, Ross discovered, in 1841, an immense vertical ice-cliff running eastward, which has been known ever since as the Great Barrier. Borchgrevinck, in 1900, climbed this cliff, and found a plain of ice extending as far as the eye could reach. Finally, in 1902, the *Discovery* expedition, after following the barrier eastward, discovered King Edward VII. land at its termination in that direction, and after wintering in Victoria land, made a fine dash over the barrier as far as 82° 17′ S. It was perfectly natural that Sir E. Shackleton should return to this region, with the exploration of which his country had become so intimately connected, and it was equally natural, since he had announced his intention of so doing, that I should refrain from entering the same field, however tempting it might appear. In any case, two expeditions of different nationalities, with the best intentions and the best spirit in the world, would have of necessity been drawn into a competition for the attainment of the highest latitude possible, and however great the sporting interest of this might have been, it would have been to the absolute detriment of scientific work and perhaps even of any definite results at all. I feel bound to add with all sincerity that I do not believe we should have attained the magnificent result achieved by my friend Sir Ernest Shackleton, and the sacrifices made by my country would thus have been a pure loss.

The Antarctic is, besides, vast enough to permit many expeditions to work in it side by side with good results, and I decided to return to the region which I had begun to study in the *Français*, in 1903–5, continuing the labours of De Gerlache. My object—a thoroughly definite one—was to study from all points of view the greatest possible expanse of ground in the Antarctic without consideration of latitude. I knew that I was devoting my energies to the region in which the ice advances farthest northward, since it begins in 61°, and I had no hope of getting anywhere near the pole. The Academy of Sciences, the Museum, and the Oceanographical Institute gave their support to the expedition; the French Government granted it a liberal subvention, which was reinforced by private subscriptions; and, lastly, a Committee of the Academy drew up for us a detailed programme of the work which it desired us to undertake.

I had built at St. Malo a three-masted barquentine with auxiliary steam-power—the *Pourquoi Pas ?*—and this was fitted out with care and supplied with the most up-to-date instruments for observing purposes. The crew of twenty-two was composed, in great part, of my old crew of the *Français*, which had shown great keenness to return with me, and the staff consisted of seven persons, whose functions were as follows: M. Bongrain, naval

officer, was charged with the astronomical, pendulum and seismographical observations, and with the hydrographical work. M. Rouch, naval officer, with meteorology, atmospheric electricity, and physical oceanography. M. Godfroy, naval officer, with the tidal observations, coast hydrography, and chemistry of the atmosphere. M. Gourdon with geology and glaciology. MM. Liouville and Gain together undertook the zoology, and M. Senouque the magnetic, actinometric work and scientific photography. This mere enumeration will suffice to indicate the nature of the various labours successfully carried out by us.

We left Havre on August 15, 1908, and after touching at ports of Brazil and the Argentine, where we met with a cordial reception, we reached Punta Arenas on December 10. On the 16th we set out for the Antarctic, and a few days later arrived at Deception island, where we filled our coal-bunkers from the depot of the Sociedad Ballenera Magellanes, and where we began our labours. After gaining Port Lockroy, in Gerlache strait, we, a few days later, reached Wandel island, where the *Français* wintered in 1904, and where we laid a depot of provisions. Thence we gained a harbour which we discovered in Petermann island. A reconnoitring expedition, with a view to finding out whether navigation was possible between Biscoe island and the coast, was very nearly fatal to three of us, who were, however, rescued by the *Pourquoi Pas?* When returning, the ship unfortunately ran aground, remaining fixed for three days, and springing so serious a leak forward that she subsequently made 48 tons of water per day. The expedition afterwards continued its voyage southward, filling in and extending the hydrography of the South American Antarctica which had been begun by the *Français*. We rediscovered the bay noted by Pendleton, and brought to light a large bay (Matha bay) on the north side of Adelaide island. This island has a length of 70 miles in place of the 8 which had previously been assigned to it. South of Adelaide we discovered Marguerite bay, and, in spite of serious difficulties, were able to survey 120 miles of new lands in a southerly direction. After several attempts, we at last succeeded in reaching Alexander I. land. Having ascertained the impossibility of wintering with a ship in this region, the expedition returned to Petermann island, where the winter station was established at a spot which offered promising conditions for the scientific observations. During the autumn numerous extended excursions were undertaken over the glaciers and along the coast.

The winter, though very mild, was very trying, a constant gale blowing for nearly nine months from north-east to east-north-east. Several members of the party suffered from severe attacks of scurvy. In the spring an attempt was made to cross Graham land, but it was impossible to surmount the perpendicular wall of granite and ice which seems to bound the whole region.

With great difficulty, by reason of the abundance of the ice from August onwards, the *Pourquoi Pas?* was able to reach Deception in December,

and we met with a splendid reception from the whalers there, who supplied us with 100 tons of coal. We carried out a number of interesting researches at this island, and then, prevented by the ice from reaching Joinville island, visited Bridgeman island, Admiralty bay, and the south coast of the Shetlands. Once more turning southward, the *Pourquoi Pas?* succeeded in passing all latitudes previously attained to the south-west of Alexander I. land, continuing the survey of this, and discovering to the south-west a new land, which received the name Charcot. Following the edge of the icepack, we subsequently made the island of Peter I., which we found to have been very correctly placed by Bellingshausen. Here we experienced a terrible hurricane. Afterwards, sailing between numerous ice-bergs and frequently within a very thick pack, we kept almost exactly on the 70th degree of south latitude until we reached the meridian of 124° west of Greenwich. The ice now became more abundant, the coal was exhausted, and the general health unsatisfactory, so that it was necessary to turn once more towards the north, and after ten days of somewhat eventful navigation, the expedition returned to Punta Arenas by Cape Pillar on February 12.

Our vessel proved an excellent one from all points of view, both in the ice and in the open sea, and we had not a single mishap with the machinery. To have stood what she did, her strength must be quite remarkable. The crew was splendid, and as to the staff, it was only through its incessant labour that the results of the mission were secured. The scientific programme was carried out with scrupulous exactitude. Some months will still be required to disentangle all the material furnished by this expedition—to study and put in order the rich collections brought back—and it is therefore difficult to give more than a dry *résumé* of the results obtained.

A number of detailed maps have been constructed with the greatest care by M. Bongrain, showing, besides the coast-lines, the position of the soundings, the limits of the pack-ice, etc. Determinations of gravity were made at La Plata, at Punta Arenas, Deception island, Wiencke island, Petermann island and Jenny island; and it can already be said that the results show certain differences from the theoretic calculations. Eight months' observations at the winter station recorded two earthquakes, five seismic storms, and a great number of microseisms. Less extended observations were also made at Deception island. Lastly, observations of the last contact during the solar eclipse of December 23, 1908, were made at Deception.

M. Gourdon was able to establish the fact that the same dioritic and granitic formations as are met with in Graham Land are found further south, and he was able to study the important volcanic formations of the South Shetlands. He also obtained proof that the main characters of the more northern regions persist in the newly explored area,

particularly in Alexander I. land and in the new lands to the south-west of this. The existence of a continental shelf is established by the numerous soundings effected during the voyage to the west, coupled with those of the *Belgica*. The various excursions carried out on the glaciers of Graham land permitted their features to be laid down on the map, while, during the winter, observations on the freezing of the sea and the formation of the pack-ice were made.

M. Rouch's meteorological observations may be divided into two sections —those made at the Winter Station and those carried out during the voyages in the ship. During the winter, two complete observatories of the First Order, the one at sea-level, the other at an altitude of 100 feet, were kept regularly in working order. The observations were supplemented by determinations of soil temperature, by actinometric researches, and by series at different altitudes. All our observations can be compared with those made simultaneously at the observatories of Punta Arenas, Ushuaia, Staten island and the South Orkneys. M. Rouch was also able to register the amount of the potential gradient of the atmosphere for ten months. The working out of the observations reveals a well-marked annual variation with a minimum in June, and a single-period daily variation with minimum at about 4 a.m. These observations were supplemented by measurements of the electric conductivity of the atmosphere, showing that, in the mean, the conductivity is the exact inverse of the potential gradient.

The studies of physical oceanography include about 100 soundings. Two hundred samples of sea-water, at the surface and at various depths, were secured, in conjunction with temperature measurements. Twenty hauls of the tow-net were made at depths extending to 450 metres (246 fathoms) and one with the vertical net at a depth of 1000 metres (546 fathoms). The soundings reveal a continental platform with considerable variations of relief, and define its limits to the west. Towards the north they complete the work of Nordenskjöld, and to the south, that of De Gerlache. They prove the existence of a submarine gully 5000 metres (2700 fathoms) in depth, and a rise situated in 70° south and 119° west of Greenwich.

M. Godfroy observed the tides at the winter quarters during a period of 225 days, and at Deception island during 18, with shorter series at various other points. From these observations it is already possible to conclude (1) that a perfect agreement exists between the amplitudes of the diurnal and semi-diurnal lunar-waves and those of Lord Kelvin's theory of the tides; (2) that the amount of the solar tides relatively to those of the moon is considerable; (3) that the tides of long period have a relatively high amplitude; (4) that an immediate effect of the variations of barometric pressure on the level of the sea is traceable, though this was apparently localized at the winter station. M. Godfroy also carried out the programme committed to him in regard to the taking of samples of air, and of the atmospheric precipitation—the latter with a view to the

determination of the nitrous compounds and the amount of ammonia. He likewise made many plans of the different anchorages, and took a large number of soundings at the same places.

M. Senouque, whose task was the magnetic observations, carried out absolute determinations of the three elements of the magnetic field at six stations. During the winter, the variations of the elements were registered by photography, while on the first and fifteenth of each month high-speed records were taken simultaneously with those obtained at the Argentine observatories at the South Orkneys and Staten island. The magnetic perturbations were very numerous, except in June and July. M. Senouque also devoted himself to the actinometric work, and a series of observations of solar radiation were made with Michelson's bimetallic-plate actinometer. These observations have shown that the atmosphere of these regions is much more transparent than that of the temperate regions. The record showed 1·55 calorie at Deception (the sun having an elevation of 50°), whilst in the park of Saint Maur, even in summer, M. Moureaux has never found more than 1·16 calorie.

MM. Gain and Liouville have brought back the most complete collections in zoology and botany. They are at present being studied, and it is already possible to state that they include many novelties. Besides the marine fauna, M. Gain has secured specimens of all the birds seen. The embryonic collections include series of embryos of penguins at all stages, as well as of other birds. Some of the eggs could be hatched by means of the artificial incubator. By means of rings of different colours attached to the feet of penguins during the first summer, M. Gain was able to establish the fact that these birds return from year to year, not merely to the same rookery, but to the same position in the rookery, and that the young do not rook until two years old.

Many specimens of parasites, both external and internal, have been brought back. Fresh water crustacea were found in great abundance in the pools resulting from the melting of the ice, the group best represented being the *Branchipodidæ*. M. Liouville collected many specimens in the field of pathological and comparative anatomy, derived from the seals. Embryos of the various species of these have been brought back, particularly those of the sea-leopard, which had not previously been seen by any naturalist. The *Cetacea* were studied by him, both living and dead, and many facts regarding them were collected at the whaling station at Deception island. Lastly we brought back for the Pasteur institute a number of preparations and sealed tubes containing fæcal matter, soil, etc., which will be studied from the point of view of bacteriology.

From this succinct summary of our expedition it will be apparent that, if the relatively good conditions under which we spent the winter, despite the comparatively low latitude of the station, permitted us to carry out a very complete and systematic programme of scientific observations and researches, taken as a whole the undertaking was essentially a maritime

ALEXANDER I. LAND SEEN FROM THE NORTH.

(*Sennique, photo.*)

QUEEN ALEXANDRA CAPE, ADELAIDE ISLAND.

(*Gain, photo.*)

PENDULUM COVE, DECEPTION ISLAND.

(*Gain, photo.*)

THE WINTER QUARTERS OF THE *POURQUOI PAS?* AT PETERMANN ISLAND.

(*Gain, photo.*)

one. Although it is impossible at present, while the experts who have interested themselves in our labours are still occupied in getting our collections and studies into order, to present any final results, I am nevertheless in a position to draw from them a series of deductions which may not only have their value for the geography and topography of the regions visited, but may also be of some use to explorers or navigators who may venture into these same localities in the future.

The recent great movement of whalers towards the Antarctic, which recalls the adventurous voyages of the sealers at the beginning of the nineteenth century (I have been assured by well-informed persons that there will be in the far south, during the present southern summer, eighteen vessels provided with oil-rendering plant), causes a considerable importance to attach to the data regarding navigation, particularly in Bransfield strait, but also in the northern part at least of Gerlache strait. I therefore think it worth while to state briefly the points of interest we were able to ascertain in regard to these localities, either by our own survey or by inquiries among the Norwegian whalers whom we were fortunate enough to meet.

Navigation in Bransfield strait seems never to be impeded by ice from November to March, at any rate in the northern and western portions; there are a few icebergs or ice-blocks scattered about and nothing more. On the contrary, in the southern and eastern portions there may be sea-ice in abundance, such as to prevent all navigation even by ships specially constructed to stand the shocks of the ice. I need hardly recall the fact that when in 1903 the *Antarctic* attempted to pick up Nordenskjöld, then wintering at Snow Hill, it was impossible, in spite of all the ice-craft of the intrepid Captain Larsen, for the vessel to cross Antarctic strait; whilst its ultimate fate when it had doubled the eastern end of Joinville island is equally within the recollection of all.

It is curious to notice in this connection that during the summer of 1908–9 the whalers had found no difficulty in crossing Antarctic strait, and had reached Hope bay without meeting with ice. Moreover, in that year they had found no ice on the inner side of Deception island. During the summer of 1909–10 we had been debarred from approaching Joinville land by ice which much resembled the description given by Captain Larsen, and in our case, as in his, the inner bay of Deception island was filled with a thick pack. And yet at our winter station at no great distance the season had been mild.

The predominant winds in this region are incontestably those from the east-north-east and north-east, always accompanied by snow and thick fog, and generally blowing with the force of a tempest. The whalers recognize but one good anchorage at which to exercise their calling in the interior of the Deception basin. They anchor in a wide bay situated just within the entrance, but the depths there are considerable, and the holding bad. Pendulum cove has been destroyed by falls of the cliff, and can hardly be

said to exist any longer. In the small bay which remains there is still good shelter from storms from the north-east and east-north-east, if one anchors in shallow water quite close to the shore, but the position is very unpleasant when the wind is from the south-west or north-west, from which quarters it often blows with great force. Sheltered anchorages with good holding ground (soft mud) are to be found in Admiralty bay, George I. island, which is divided into two fairly deep fiords, formerly and still very occasionally frequented by the whalers; the best occur in the north-east fiord. Of this bay we executed a particularly careful survey. Unfortunately, it is just in this part that there may be the greatest abundance of ice *débris* derived from the high cliffs terminating the enormous glaciers which cover the island. This may not only make all movement impossible, but may even put vessels in real danger.

The whalers (so they informed me) sometimes find a temporary shelter against squalls from the north-east, with good anchorage, in South bay, Livingstone island, but there is no possibility of landing in this bay, which is bordered by an ice-cliff and is open to the south and south-west. They also stated that they found some temporary shelter from sudden gales on the coast of Palmer Land, especially at Astrolabe and Trinity islands. As they are often obliged, in chasing the whale, to push a considerable distance into Gerlache strait, Port Lockroy, discovered by us in 1904, would offer them excellent shelter and a quite safe anchorage, though there may be a good deal of ice in it, and in November, 1909, the roadstead was completely blocked by heavy pack-ice.

In Gerlache strait the voyager meets only ice-blocks, a few rare ice-bergs, and drift-ice derived from these; but in Bismarck strait, which is merely the entrance from the Pacific into Gerlache strait, navigation may be rendered very difficult, if not impossible, by thick pack interspersed with ice-bergs. Rocks, too, are numerous and treacherously concealed, rendering the exit extremely perilous, even when the weather is calm and clear and the absence of ice permits the bottom to be seen from the masthead. It seems that in 1908–9 we must have had the advantage of a season exceptionally free from ice in these localities.

Middle island continues to appear on the Admiralty charts, though I am at a loss to know who is supposed to have discovered it. It certainly has no existence. Nordenskjöld had already stated this, and Bellingshausen, whose map of the Shetlands is very good, as are also his views of the coast, had given no indication of it either.

The little bay in Wandel island, where the *Français* found it possible to winter in 1904, is, in fact, an execrable spot, and we may consider ourselves fortunate in having spent nine months there in 1904 without serious damage. The small size of the vessel evidently contributed much to this result, for, placed as we were at the extremity of the cove, we were able to stretch one of our big chain-cables across a narrow neck, and against this the small ice, and sometimes even blocks of large size, accumulated so as

to form a floating rampart which prevented us from feeling any severe effects of the surf. But a vessel of the size of the *Pourquoi Pas ?* would be placed in jeopardy. In fact, this cove is open to the north-east, *i.e.* to the winds which are most frequent and most dangerous. From the moment they begin to blow, sometimes even for several hours previously, the surf becomes dangerous, and the *Pourquoi Pas ?* was in a position which caused anxiety during her stay of a few days in January, 1909. Not only was it impossible to protect her owing to her size, but the state of the ice at that season added to the risk. Small ice and sea-ice were entirely absent, and the formation of a protecting rampart as in the case of the *Français* was thus impossible. On the other hand large ice-blocks were numerous, and in spite of our attempts to form a barrier by means of wire hawsers, they constantly broke or overrode them and threatened the ship. Nevertheless it may be worth while to mention that in summer, in spite of the truly imposing accumulation of ice in this cove after a north-easterly storm, a ship runs no risk of being held fast, for as soon as the wind ceases to blow from this quarter, even though a calm succeeds, a permanent current to the northward soon carries them away. Things are different at the close of the winter season. Although the winter of 1904 was appreciably different from that of 1909, a thick coast pack formed during both years in the northern bay of Wandel island, and we were driven to opening a channel by force in order to free the *Français* in December. A reconnaissance showed me that in November, 1909, the coast pack was still more extensive and thick, and it would have been extremely difficult to set a vessel free at that time.

For all this, I still think that Wandel island would be an excellent spot in which to establish a permanent observatory; for it seems to me that a ship could always reach this spot to replenish its supplies during summer by taking the route *via* Gerlache strait, and could easily, by making use of the experience gained on our two expeditions, find shelter during the few days required for unloading the stores and other material. It is to be wished that the Argentine Government would put this scheme, which has been under consideration for several years, into execution.

In Petermann-Lund island, some 10 miles further south, we found a decidedly better harbour, and we made a careful survey of it. A vessel would find excellent temporary shelter there, although during winter it presents certain dangers arising from the surf and from ice-blocks. But this harbour is not open every season; and in 1904 it would have been impossible to make use of it, for it was completely blocked by the coast-ice, at least from February to December. Large icebergs too, by completely sealing up Lemaire channel and Salpetrière bay, may bar access to it.

Throughout the whole remaining ground covered by our expedition we did not discover a single spot at which one could think of wintering with a ship. One meets everywhere with precipitous walls of ice from which masses are constantly breaking away, and bays offering no possible anchorage

by reason of their depth, the nature of their bottom, or their exposure to winds from the north-east or east-north-east, which almost always blow with the force of a gale, and which are so frequent as to justify their being characterized as permanent. To this must be added a constant movement to and fro of large ice-blocks and icebergs, which occur in large numbers, and frequently fill the bays entirely, so that no ship could escape them.

In spite of the considerable difference in the state of the ice at the dates of our two expeditions, navigation between the chain of the Biscoe islands and the coast proper has always appeared to me impracticable south of Petermann island, while the many dangerous reefs would also render it extremely hazardous. As far as Adelaide island this whole coast is formed of imposing glaciers, almost all with impracticable faces, and descending like cascades or torrents from high precipitous mountains. Apart from small islands or reefs, a few rocky points, and the few cases where the glacier faces are low, landing is an impossibility. Moreover, even on relatively practicable glaciers all advance is soon barred by a high wall of granite rising abruptly to a height of over 1600 feet, and topped by a thick layer of ice, possibly, as seemed indicated by a view from the seaward, forming an interior ice-sheet.

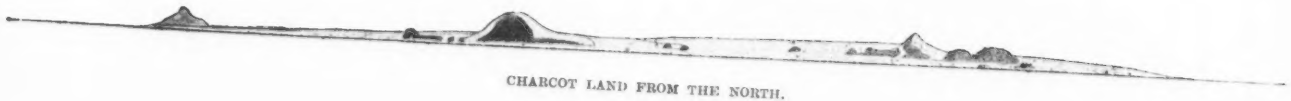
To the west of the Biscoe islands, it appears that navigation ought always to be easy as far as the northern part of Adelaide island, for though icebergs are always numerous they are widely scattered and become less frequent the further one moves from the coast. The sea is forbidding and agitated, and seems in fact to be rarely calm.

Biscoe islands are extremely numerous, following one after another and overlapping so as to form a vast chaplet. The most northern, that named by us Victor Hugo, stands alone and at a distance from Graham land. This chaplet of islands terminates southward in Adelaide island which forms their continuation, as may be also said of Alexander I. land. All the Biscoe islands are capped with ice, and, although of different size, present a uniform character. We were unable to find the island named by Biscoe Pitt island, of which, with its interior bay, he speaks in his logs; but we have marked on the map, with the name Pitt, a large capped island nearly corresponding with Biscoe's in its latitude and longitude. I am not aware of the reasons for which the English Admiralty Chart marks high peaks on this island, for Biscoe speaks of such in none of the documents that I have been able to consult, and none of the islands display them. As I have just said, Adelaide island and Alexander I. land may be considered part of the group, of which they will then be by far the largest units, and the only ones whose summits break the monotony of the uniform ice-caps.

Almost exactly in the latitude indicated by the American whaler Pendleton we succeeded, by passing between some of the more widely spaced of the Biscoe islands, in making our way into a vast bay encumbered

ADELAIDE ISLAND FROM THE WEST.

ALEXANDER I. LAND FROM THE NORTH.



CHARCOT LAND FROM THE NORTH.

by ice. The details given by Pendleton prove without question that he did cruise in this region, and I do not doubt for a moment that the bay indicated by him is really that rediscovered by us. To the north of the island there is a vast fiord with complex ramifications to which we have applied the name Matha. This fiord must certainly be very deep, but a solid and thick coast-pack prevented us from surveying in completely. It is at this fiord that the narrow channel separating Adelaide island from the mainland terminates. In its navigable portion the fiord was encumbered by masses of ice of all sizes, including very large bergs, mostly tabular in form, or originally derived from such. In one of the islets there is an important rookery of Adelie penguins, evidently occupied for many years, and apparently indicating the presence of open water of some extent.

Adelaide island has been well described by Biscoe, whose only mistake had to do with its size. While he gives it a length of 8 miles, it really extends to 70. Biscoe thought himself very much nearer to it than he really was, and it is for this same reason that he gives a height of 10 feet to the ice-cliffs which in reality reach 100 feet. Its general shape is that of a kidney bean with the concavity turned towards the continent. Its whole eastern coast is formed by a magnificent mountain mass, whilst its western side is composed of an enormous ice-cap, showing a convex surface of almost mathematical regularity. It was Biscoe's mistake in regard to its size which led us to think we had discovered a new land when wrecked in the *Français* on its coast. The *Belgica* followed the coast of Adelaide island, though it was for the most part concealed from those on board by fog. With more favourable weather they would have been able to execute the survey which we effected ten years later.

In 1905 we fell in with ice forming a thick and closely pressed pack about 70 miles north of Alexander I. land, and ending abreast of a line terminating the northern third of Adelaide island. In 1909 the conditions were more favourable, and we only found the pack to the south of this island, being thus able to follow the western and southern coasts. The voyages of Evensen, De Gerlache, and our own in the *Français* seem certainly to indicate that, as a rule, the pack forces the navigator who, coming from the north, follows the coast of South American Antarctica, to bear to the south-west roughly in the latitude of Adelaide island. In 1909 we were possibly favoured by an exceptional state of the ice, and unfortunately no information on the subject is to be had from the voyages of either Bellingshausen or Biscoe. The point is however important, for an expedition which, like our own, might reach the south end of Adelaide island, and might decide, say, to winter on land at some point on Marguerite bay, would perhaps run the risk of seeing its communications with the ship cut for several years in succession.

Along the west coast of Adelaide island, reefs just awash are in considerable numbers even at a distance from the land. Some of these reefs

ON A GLACIER, GRAHAM LAND.

(*Gain, photo.*)

THREE PEREZ CAPE, GRAHAM LAND.

(*Gain, photo.*)

NATURAL ARCH FORMED IN THE ICE.

(*Charcot, photo.*)

ADELAIDE ISLAND SEEN FROM THE SOUTH, AND SHOWING THE JUNCTION OF THE ICE WITH THE HIGH MOUNTAINS.

(*Gain, photo.*)

have their position marked by large icebergs, which generally occur in groups. These have probably been stranded on shoals or held up by pointed rocks. It is important to note the mistake made by some navigators—a mistake of which we were ourselves the victims on board the *Français*—in thinking that, as the icebergs draw a large amount of water, a vessel may feel quite secure in their vicinity.

At the south end of Adelaide island the great ice-cap terminates abruptly, without transition, in a fine cape formed by the approach to the sea of the chain of high mountains referred to above. I have the honour to bestow on this cape the name of Queen Alexandra. A narrow channel strewn with islets separates Adelaide from the land to which we have given the name Loubet land, and which is continued southwards by Fallières land, thus forming a vast bay which we have designated Marguerite bay. The channel was occupied by a thick coast pack, which both bordered the coast and probably abutted on Alexander I. land, and was impassable by a ship although only of a moderate degree of compactness. This pack enveloped a number of islets and contained some enormous tabular icebergs, especially towards the south.

We were able to touch at a small island about 2500 feet in height (Jenny island) not far from Cape Alexandra. This island might possibly form a good land station to winter in, for houses could easily be built on a fine level terrace formed of boulders. If the ice which connects it with the neighbouring islands does not break up, it might be the starting-point for some interesting sledge excursions. It is, however, to be feared that on the one hand this island may only rarely be attainable by a ship, and on the other that it may be isolated from the coast by a loose pack impracticable alike for a vessel and for sledges. This is what seemed likely to happen during our stay. However, if the first eventuality were realized during the course of an expedition, the probability is that persons wintering ashore could make their way to a ship lying in Matha bay by crossing the pack-ice in the channel.

Both Loubet and Fallières lands show, morphologically, a complete analogy with the lands farther north; they appear, however, less elevated, and from a distance at least their glaciers seem more practicable. They are intersected by deep fiords, and the *tout ensemble* of this part of Antarctic, beginning from the Shetlands, forcibly recalls the Chilian coast of Patagonia. Marguerite bay and the whole area separating this part from Alexander I. land is strewn with islets and with many and dangerous reefs just awash, on which the sea does not even break. Icebergs and *débris* of icebergs are in vast quantities, and the pack-ice which we had to traverse with great toil in order to reach Alexander I. land was formed of blocks of large size and remarkably thick—a fact which seems to prove that this ice is not broken up every year. A ship overtaken by a storm in this region would find itself in an almost desperate situation.

Like Adelaide island, Alexander I. land is composed of an enormous

ice-cap, but in its case this cap is surmounted by two ranges of mountains at right angles to each other, forming as it were, when represented diagrammatically, the two arms of a huge T, the shorter running from east to west, and the longer from north to south. The former ends in the sea, and I should not be surprised to find that the east coast of Alexander I. land is formed by a mountain mass comparable to that of Adelaide island. There is no doubt that Alexander I. land is a large island separated from the continent by a wide strait. On the other hand, I cannot assert positively that Fallières land is prolonged westward so as to join Charcot land; still, while taking due count of the illusions of which explorers may so often be the victims, I believe that I saw some high summits farther south. The discovery of Charcot land to the south-west of Alexander I. land certainly seems to confirm the idea of a continuity of land, and the presence of a permanent stretch of pack-ice, with a northern limit which varies to but a slight extent, seems to support what can hardly be called an hypothesis.

Charcot land evidently forms one continuous land, which is well characterized by three summits, certainly rocky in structure, which emerge from a wide and elevated terrace of ice. We have assigned it on the map the limits within which its existence was recognized by all on board, but I may be permitted to state that several of the party could distinguish it stretching both east and west into the far distance, and the limits laid down have been adopted so as to avoid all suspicion of exaggeration.

From this land to our farthest westerly point we followed the edge of the pack, often entering it, but making no effort to force a way through it. From 73° to 80° west of Greenwich our course lay to the south of the track, including a portion of the drift, of the *Belgica*. From 82° to 87° we crossed the line of this drift, and then, as far as Peter I. island (most accurately placed on the map by Bellingshausen) we kept to the north of the *Belgica*'s drift, and to the south of the Russian navigator's track. No island, nor even the suspicion of an island, was met with, and Peter I. must be considered as an isolated outpost. On the other hand, our soundings, in conjunction with those of the *Belgica*, confirm the existence of a continental plateau in this locality. From Peter I. island our course was sometimes to the north, sometimes to the south of Bellingshausen's, but constantly north of that of the *Belgica* as far as 103°—the position where that vessel escaped from the pack. At this spot we discovered a very large indentation in the pack—the same, evidently, as had been found by the *Belgica* in 1898, by Knox in March, 1839, and by Cook in January, 1774; while Bellingshausen would very probably have found it in 1821, if he had made more southing, and must in fact have observed its commencement. He says that on reaching the longitude in which Cook attained his highest latitude he voluntarily passed on, continuing his voyage in a due easterly direction. This justifies the supposition that he would have been able to advance southwards, thanks to the absence of ice, for, with the vessels of those days, there could have been no question of an

attempt to force a way through the pack. The persistence of this notch in the ice is in my opinion an important piece of evidence in support of the existence of a land to the south, for such permanence can hardly be explained otherwise than by the supposition that fixed points of resistance exist in that direction.

When Knox says that he was brought up in 70° south, 102° west, by a high wall of ice, it is evident that he was the victim of a mirage effect such as we have experienced ourselves in the Antarctic on several occasions, for no such wall has been seen, either by the *Belgica* or by ourselves, though in our south-westerly course we passed the point reached by the American expedition. The track of Cook, which took that meritorious navigator on January 30, 1774, to the latitude of 71° in longitude 107° west, ran roughly from north to south and then from south to north, so that, except on the 107th meridian, the track of the *Pourquoi Pas?* from 103° to 124° lay far to the south (three and even five degrees) of those of previous navigators. We crossed Cook's route 30 miles to the north of his turning point, thus meeting with the pack half a degree farther north than he did. We should have found no difficulty in reaching or even probably in passing his extreme latitude, had we forced a way through the pack, which was not particularly solid at this point. But as this would have been an advance of a few miles only, and without special interest, I felt that it would be better to economize our scanty stock of coal for a more useful effort in a region hitherto unknown. When, after having followed the seventieth parallel, with slight deviations to the north or south, we were forced by the failure of our coal supply, coupled with a fresh outbreak of scurvy, to bring our labours to a close at 124° west, the ice seemed to trend towards the north-west, and then even sent a tongue of thick pack-ice to the east—an obstacle through which we had to force our way. Nevertheless there is no reason to conclude that, if it had been feasible to continue our voyage, we should not have been able to turn this extension of the ice and regain our former latitude in this direction. This is a piece of exploration which seems to me of great importance, and one which is well worth resuming.

Our course from Peter I. island to our extreme westerly longitude was rendered excessively perilous by the truly incredible number of icebergs in the midst of which we had to wind our way. Several thousand were constantly in sight, and I think I am justified in saying that even a vessel possessed of specially good tacking qualities would have been unable to steer clear of them under sail only. The presence of these icebergs covering such a vast extent of sea seems to prove the proximity of a land-mass, and it is noteworthy that in form, aspect, and size, most of these were identical with those bergs met with in the vicinity of South American Antarctica. It is not, however, to be supposed that all can be derived from the latter land-area, since the extreme abundance above-mentioned only began after we had left Peter I. land.

The fact that we were able to take a course so far to the south of our predecessors inclines me to the opinion that we had the advantage of exceptionally favourable conditions, and it may be that the pack of normal years breaks up after a mild winter or series of winters, or that, in consequence of an unusual succession of favourable winds, it had released from its grasp icebergs that had long been held fast. Our soundings revealed the existence of a continental plateau forming a prolongation of that brought to light by the *Belgica* farther east; while the permanent notch of which I have spoken, as well as the icebergs, is an additional argument for the presence of a continental coast-line. Lastly, the aspect of the pack is identical throughout this whole region from Charcot Land to 124° west. Commandant De Gerlache, with whom I have had long and interesting conversations on this subject, shares my opinion, and, besides, called my attention to the fact that the mere examination of the drift of his ship when fast in the ice was in favour of this hypothesis.

During the whole of our expedition the predominant winds, and the only ones which blew with violence, were those varying from east-north-east to north-east. At the position of Peter I. island the storm which overtook us began from the east-south-east, but it quickly veered round to the east-north-east. The predominance, not to say permanence, of these winds clearly helps a navigator sailing from east to west, as has been justly remarked by Dr. H. R. Mill. Unfortunately they are always accompanied by snow and thick weather, which obscures all view, and, apart from the dangers to which the vessel is exposed, causes the voyager to lose the advantages arising from the rapidity of his progress. The storms of this region, which last from twenty-four hours to four days, are generally succeeded in summer by one or two days (sometimes only a few hours) of clear weather. The ideal condition would be to have a vessel possessing a motive power and supply of fuel which would permit her to stand by without drifting while the storms lasted, and to make good headway when favoured by a few hours of fine clear weather.

I feel that I ought, before closing this rapid summary of ideas suggested by our voyage, to remark once more that, at the present moment, definitive conclusions are out of the question. Any such conclusion can only have real value when it rests on observations studied in their most minute details, and compared with those of other expeditions—a task which can only be carried out when all our results shall have been definitely revised and worked out. Thanks to the zeal of my colleagues since their return, coupled with their thorough work during the course of the expedition itself, this task ought to be finished within a few months at most.

As regards further explorations which could and ought to be undertaken in this quadrant, it seems to me that it would be both possible and highly interesting to explore Fallières land, and even the regions to the south and east of this, by means of sledge parties. A station might be established on Jenny island, perhaps even on some point of Fallières land.

The difficulties would be great no doubt, but I have already dwelt on them at sufficient length to make it unnecessary to recur to them here. I should like, however, to add that, though I think it possible for explorers to return to Matha bay, if pressed by necessity, it appears to me, judging from my two years' experience, improbable if not impossible that the ice-conditions, even in winter, should be such as to permit the approach to Petermann or Wandel islands otherwise than in a ship.

The further prosecution of our western voyage beyond 124° west ought to be undertaken. There would be considerable interest, and possibly advantage, in attempting one or two side excursions in a due southerly direction between Petermann island and our farthest west. This was not done by us because I considered it of more interest to push on westward, especially as the serious injury to the fore part of our ship compelled us to exercise a certain caution. If, as I hope, the *Pourquoi Pas?* with all its equipment is to be definitely set apart by the French Government for scientific explorations, comparatively small sums of money will be needed to continue our work in this region.

The appreciation accorded by the Academy of Sciences and other learned bodies to the labours of this last expedition justifies me in saying that it has done a useful piece of work; and in this I do not lay myself open to the charge of vanity, seeing that those labours were performed by my coadjutors. May the results prove once more the importance and value of Antarctic expeditions!

The PRESIDENT (before the paper): To all who have any knowledge whatever of the subject of Antarctic exploration, the name of Dr. Charcot, our distinguished lecturer to-night, needs no introduction whatever. To those who have not made a special study of this subject, I may perhaps mention that Dr. Charcot's first expedition to the Antarctic was undertaken some seven years ago, and that he returned from that expedition well laden with scientific results. His second expedition, the one he is going to speak of to-night, he has only just concluded. The fact that Dr. Charcot has not reached the South Pole is perhaps sufficiently accounted for by his never having tried to do so. His object was to select a portion of the globe's surface, and then in successive expeditions to endeavour to learn everything that could be learned about it. His expedition being well equipped by scientific experts, he has succeeded admirably in his endeavour. So well has he succeeded, that that part of the coast of the Antarctic lands which lies to the south of South America will in future always be associated with the name of the *Pourquoi Pas?* that excellent little vessel which carried him and his gallant companions across the stormy and ice-covered seas, and still more with the name of Dr. Charcot himself, the distinguished leader of the expedition.

The PRESIDENT (after the paper): In opening the discussion on the interesting lecture we have just heard—a discussion in which I am sure the warmest appreciation will be expressed of the scientific results of this expedition—it is natural I should first call on those Englishmen who are best capable of expressing the thought-out opinions on the value of this work.

Sir ERNEST SHACKLETON: I will confine myself to just two or three remarks

to-night, and the first is that as regards the work in those seas towards the edge of the Antarctic circle, I consider there are there greater difficulties to be faced than when you are further south with more settled weather, and when I heard the accounts of the gales, and saw the efforts that had been made to keep that ship safe and quiet during those long months of storm, I came to the conclusion it is better to have a wintering party and no ship in such quarters; and keep the ship for navigation during the summer. What Dr. Charcot has gone through to my mind must have been one of the hardest experiences possible. I want as a Polar explorer to congratulate Dr. Charcot on the wonderful work he has done. Through all those months of storm, scientific work went on, and, after all, scientific work is the work that tells in the long run, and is the permanent record for any expedition, and where we see all this work carried on so faithfully through this time, we can only give a full meed of praise to the work done by Dr. Charcot, and I know I am echoing the words and the sentiments of the five members of our own expedition present to-night, and as their mouthpiece, I may say that, as explorers, we congratulate Dr. Charcot from the bottom of our hearts, and are so glad he has come back safely.

Admiral Sir Lewis Beaumont: As one of those who has been to the North, I can fully appreciate and thoroughly understand the great value of the work that has been done by Dr. Charcot and the *Pourquoi Pas?* It is simply wonderful that they should have come back at all, when you think that the bottom of the ship was actually reduced in one place to half an inch of wood between the sea and themselves. It is undoubtedly a most difficult region in which to succeed, because you can see by the actual trend of the land that the force of the north-east wind must keep piling the ice on to the coast, and the ship that gets too near, or tries to winter, is running very great risks, and when any ship finds her way back again from these regions successfully, it reflects the greatest credit, not only on the navigators, but on the commander of the expedition, who has had the courage to enter them, and the good fortune to bring his ship back. Sir Ernest Shackleton thought it was better to go further in than to skirt along the edge of the ice, but the object now of Antarctic exploration is to connect the different points of land which have been discovered by various explorers, and to establish the fact, if it is so, that they make one continuous continent. Dr. Charcot's expedition has been of very material assistance to the development of that work; every addition he has made is of special value. It is many years since any land beyond Alexander Land has been placed on the chart, and it is a great satisfaction to think that it is now connected with the name of Dr. Charcot.

The President: I am certain that every one here present feels how pleasant it is to be assembled in order to give a warm welcome to a distinguished traveller from the other side of the Channel, and it is specially pleasing to be giving this welcome to him in the presence of the representative of the great nation to which he belongs, His Excellency the French Ambassador having honoured us by attending here to-night. I have called on the two first speakers so that all might hear at once the opinion that those who are best able to judge have of Dr. Charcot's work, and I hope His Excellency may have some opportunity of conveying to his countrymen the high appreciation of the great scientific value of this expedition which is entertained in this country. We had hoped to-night to have been honoured by the presence of H.R.H. the Duke of Orleans, who is, I am proud to say, a Fellow of the Society, and who wished to be present to hear the lecture delivered by his fellow-countryman. We are all specially sorry for the cause of his absence, which is the illness of H.R.H. the Duchess of Orleans.

M. Cambon: I thank the Royal Geographical Society for the kindly manner

it welcomed my countryman, Dr. Charcot. Dr. Charcot is an example of the most valuated qualities in England, sense of enterprise and strength of character. It is a great satisfaction for me to ascertain that in both countries, England and France, we possess men whose boldness and ardour are second to none of the ones displayed by the greatest explorers of the past. You have Shackleton, we have Charcot, and the presence of these two remarkable men proves that our *entente cordiale* works also in the interest of science.

Dr. H. R. MILL: Speaking as a student of the history of Antarctic exploration, I wish to express my admiration of the way in which Dr. Charcot has described the important second voyage of exploration which he has made into those seas. It is somewhat curious to notice how many nationalities have contributed to our knowledge of that particular quarter of the Antarctic region. The first land ever found within the Antarctic circle was discovered there by the Russian Bellingshausen just ninety years ago, and named by him after the Emperors Peter and Alexander. Then came Biscoe in 1830, who, not knowing of Bellingshausen's expedition twenty years before, discovered Biscoe islands and Adelaide island. No further advance was made until the drift of the *Belgica* in 1897, and now Dr. Charcot has, in the most interesting manner, connected together all the earlier isolated discoveries, and showed how much greater they were than the discoverers themselves had supposed. I hope that Dr. Charcot will once again set out and pursue that thoroughly sound method to which he referred, of voyaging as far south as possible from east to west. All circumnavigators of the Antarctic have, with amazing stupidity, followed each other round the world from west to east, always fighting against head winds and warning their successors to profit by their example and go the other way round. The right direction was followed by the *Belgica* and Dr. Charcot himself in Bellingshausen sea, and Balleny and Wilkes on the other side. Attempts in the right direction were made by Captain Scott and by Sir Ernest Shackleton, who on their way back from Macmurdo sound would have obtained most interesting results but for want of coal. If ships could start full of coal and make their way in the right direction, that is to say westward, I am confident that we would soon acquire a definite knowledge of the outline of the Antarctic continent, and no longer have to make use of the hypothetical lines which now disfigure the map.

Mr. L. C. BERNACCHI: As the President has already remarked, this quiet, unostentatious, and really solid scientific work of Dr. Charcot compels our deep admiration and recognition. In looking at those very beautiful photographs shown on the screen, I was very much struck with the ice resemblance between that part of the world and the region in the Ross Quadrant much further south. I speak of King Edward VII. Land, where the ice conditions are very similar—that is, similar heavy masses of pack-ice, difficult ice navigation, and those crescent-shaped islands so admirably described by Dr. Charcot. It must be remembered that the latitude of King Edward VII. Land is 10 or 12 degrees further south, so that the ice line on the other side is much further north. Not only is the ice-line much further north, but I think probably the climatic conditions and the general conditions are more severe in the latitude in which Dr. Charcot wintered than in the corresponding latitude in the Ross Quadrant. In a few years' time we shall be able to compare all these scientific observations in the Antarctic, these magnetic and pendulum observations and geological observations, etc., and we shall find we have made an enormous stride in our knowledge of these branches of science, and possibly even we may be able to acquire through these very observations in the Antarctic, a practical knowledge of terrestrial magnetism and atmospheric electricity, and even utilize that knowledge for practical purposes.

Dr. CHARCOT: I simply want to tell you how very much touched I am by what has been said. When men that I admire like Sir Ernest Shackleton, Sir Lewis Beaumont, Dr. Mill, and Mr. Bernacchi have said the things that they have said this evening, it is really the greatest reward that an explorer may have for all the work he has tried to do. I do not merit it, but I thank you all the same with all my heart for having said all those nice things now that I have come back, and not before I left, for certainly the *Pourquoi Pas?* would not have been big enough to hold me!

A JOURNEY ACROSS THE ORDOS.*

By Major GEORGE PEREIRA.

WITH a view to proceeding overland to Burma, I left Peking on June 3, 1910, taking the Chinese constructed railway which runs north-west to Kalgan, a distance of 123 miles. There I engaged three carts to Kuei-hua-ch'eng, 207½ miles distant. This country is bare and treeless, sparsely inhabited by Chinese, who, during the last forty years, have been gradually buying up the land, pushing the Mongols slowly but relentlessly further north. Wheat, beans, and oats are the chief crops. Dust-storms, coming from the west, were very prevalent. In Northern Shan-si they talk a very pronounced dialect, more difficult for a Pekingese to understand than any other part of North China. I came across several of the Belgian missionaries, the only foreigners I met with all the way to Ning-hsia Fu, with the exception of Mr. Oberg of the Swedish Mission at Sa-la-ch'i, and a party who were visiting him.

The Chih-li Shan-si boundary runs through the town of Hsi-ying-tzu: most maps show it too far east. Shan-si Province has recently been extended westwards and now takes in the valley of the Huang Ho (north of the Ordos) nearly up to the town of Tung-wang-yeh-fu (not a prefectural Fu), marked on maps as A-shan, a name unknown to the Chinese, and where it now joins on to Kan-su. Kuei-hua-ch'eng, officially called Kuei-hua T'ing, has from 70,000 to 80,000 inhabitants, and is probably the most densely populated city of Shan-si, Ta-t'ung Fu coming next. The walled Manchu town of Sui-yüan-ch'eng is 1½ mile to the north-east of Kuei-hua-ch'eng.

Here I engaged three Peking carts, each with two good mules, for the journey across the Ordos to Ning-hsia, a distance of 403¼ miles, and which took us twenty days. The charge for each cart was only 40 local taels, about £5 6*s.* 8*d.* I purchased a native tent for the desert journey.

Leaving Kuei-hua on June 15, I proceeded westerly across a wide fertile plain, bounded a few miles to the north by a great rugged range, called the Ta-ch'ing Shan, and stretching away south to the Yellow river (Huang Ho). Chinese emigrants are constantly arriving, some only

* Map, p. 348.

staying for the season to work in the fields, attracted by higher wages. Wheat, millet, barley, beans, and sesame are the chief crops.

The chief towns are P'i-hsieh-ch'i, with some 1500 houses, Sa-la-ch'i T'ing, and Pao-t'ou-chen. Sa-la-ch'i T'ing, also known by its Mongol name of K'u-lun-erh, is 78 miles west of Kuei-hua-ch'eng, and is wrongly marked on all maps I have seen. It has about 8000 inhabitants.

Pao-t'ou-chen, exactly 100 miles from Kuei-hua, is the principal city of the district, with a population of probably about 15,000 to 20,000 people. It is a great centre for the wool trade and also for coal, which comes from the hills about 18 miles to the north. It has a large supply of carts, but very few go annually to Kan-su Province, owing to the difficulties of the journey. In the winter they follow along the north bank of the Yellow river, and then go south by San-tao-ho to Ning-hsia Fu, taking from eighteen to twenty days on the journey; but in summer this route is not practicable, owing to floods, and they prefer to cross the Ordos. As no supplies can be obtained in that desolate region, it is necessary to carry food and forage for nine days. Travellers usually prefer to go by boat up the Yellow river, a laborious journey which takes nearly a month, as boats have to be towed by four or five men all the way.

For the Ordos journey camels, though slow, would be preferable to carts, as they can go anywhere, whilst I would advise anybody using carts to have three mules (instead of two) to each cart. One of my carters had previously once made the journey across the Ordos, and I was surprised to find how, with so few people to direct us when once in that country, he was able to find the way. He also claimed to have a mastery of the Mongol language, but in this respect, as might be expected, he proved to be an utter fraud. Another of my carters was a hopeless opium sot, and spent most of the days asleep on his perch, varied only by bouts of walking exercise, in which I made him unwillingly indulge.

Leaving Pao-t'ou with my two boys and the three carters on June 20, we crossed the Yellow river by ferry, near Lan-kuei-yao-tzu, about 24 miles west-south-west of Pao-t'ou, and proceeded westerly along a narrow strip of sandy soil between the Yellow river and the Ordos sandhills, sparsely inhabited by Chinese, till we reached the limits of civilization at Te-sheng-heng. Here there is an inn and a fort of ten or eleven Chinese soldiers. Just after crossing the ferry, I was kicked by one of my mules and the cart-wheel ran over my leg. Fortunately, in the absence of any sort of doctor, no bones were broken, the journey was not interrupted, and after two days of confinement to the cart, I was again able to walk.

On June 23 I left Te-sheng-heng, the local guard turning out, some saluting and others not, "more sinico," and after a mile I reached a sandy ridge, 100 to 200 feet high, running roughly parallel to the Yellow river, and forming the northern boundary of the Ordos.

The part of the Ordos I crossed, a distance of 172¼ miles to Shih-tsui-tzu, may be divided into four sections, viz.—

First section (47 miles), to the Da-ba-sun Nor (lake) is a dreary waste of sand, broken up by sandhills, mostly thinly covered with scrub, 1 or 2 feet high, with an occasional bush 3 feet high. Here we met an occasional Chinese coolie, returning home after working for the local Mongol prince, and at the wells we usually found two or three flocks, tended by a few Mongols. The going was very bad, and our rate of progress was usually under 2 miles an hour.

Second Section (37 miles), to Shih-li-nor-rai is the most pleasant part. I saw nearly a dozen small Mongol lamaseries, a fair number of sheep, goats, bullocks, camels, donkeys and ponies grazing with two or three Mongols in charge of each flock, the country more open, and the going much better. The same low scrub. A conspicuous ridge, 300 to 400 feet high, runs north-west through this section.

Third Section (59 miles), to 9 miles south-west of the San-yen-ching (well). There is a gradual rise over a succession of interminable small ridges with a final descent to a plain. There are only two wells. We did not see a single mongol hut or flock, or meet anybody on the road. It is a desolate waste of dry grass and weeds, with dwarf scrub 2 or 3 inches high.

Fourth section (29¼ miles to the Yellow river), there is a gradual descent. I saw two lamaseries and an occasional Chinese merchant or coolie going into the country.

Altogether the part of the Ordos that I crossed is a dreary desolate country without a patch of cultivation, and I did not see a single tree till I reached the banks of the Yellow river. Rarely, except when entering or leaving the country, did we meet a soul on the road. The country is entirely dependent on the wells, some of which are revetted with sticks, whilst others are protected with stones, and these form little centres, near which the Mongols gather with their flocks. It appears to be very thinly inhabited, and I do not think I saw 100 Mongols in the whole journey. Sometimes two or three of their circular huts, made of sticks covered with felt, about 12 feet in diameter, and 9 to 12 feet high, are found near a well, but for the last 88 miles I did not meet a single Mongol, until I came across a party of a dozen, acting as ferrymen on the Yellow river. I also saw about 20 or 30 Chinese, chiefly coolies, trekking across the country for work.

In all the surrounding country, and I believe even in the eastern part of the Ordos, Chinese emigrants are pushing forward and ousting the Mongols, but in these parts the absence of water, and the altitude which precludes all possibilities of irrigation, makes the country of no value, except for a little grazing, and even Chinese doggedness has not ventured to push in.

There are no buildings excepting one ya-men on the lake and about a dozen small lamaseries. Of the latter the biggest I saw was the Hou-ching-chao, a brick building about 28 feet square, surmounted by a Chinese

CART STUCK IN ROAD, EAST OF SA-LA-CHI-LI.

CAVE DWELLINGS IN LOESS, KUEI-HUA.

roof, with two smaller temples at the side, and about a dozen mud huts for the attendants, said to be about thirty or forty in number.

Except where sand has obliterated the traces, I usually found cart tracks, though we only saw three small bullock-carts belonging to a lamasery. Wild flowers of many varieties are found. Lizards are the chief product of animal life, whilst small brown rats are numerous. Deer are plentiful in parts, especially in the third section, where in one valley, 9 miles from Shih-li-nor-rai, I saw about 400, but at other times I never saw more than about thirty at one time. Hares are fairly plentiful, and there are a few partridges, sand-grouse, wild pigeons, and cranes, exclusive of hawks and small birds.

The Da-ba-sun lake, called by the Chinese Ta-yeh-hai-tzu, is marked too far north and shown too large on maps, which call it the Chara-mannai Nor, but the local Mongols had never heard of this name, or anything like it. It is about 8 miles long from north-east to south-west, and from 1½ to 2 miles wide. There are of course no boats on it. There was water in the western part, whilst the eastern portion was a morass, covered with salt, like a thin coating of ice. After crossing over about 1000 yards of the dried-up part, the ground gradually became softer, and I was unable to proceed. A local Mongol told me that after rains it is sometimes over 6 feet deep in places. The salt forms part of the revenue of the local Mongol prince Hangin (in Chinese Huang-kai), who is stated to live some 9 miles further south. Excepting for the wells, I only found fresh water in two small streams (one at Mou-pa-la, and the other flowing for a short way to the lake), but even these soon ran into the sand. The rest of the stream-beds were dry, and most had traces of salt.

With a total absence of any protection from the sun, the weather was generally hot by day and chilly at night; once at 1 p.m. my thermometer registered 90° Fahrenheit, whilst at 5 a.m. the following morning, with a north wind, it was 41°. Fortunately we only had two slight showers and one most unpleasant sandstorm.

The word Ordos is unknown to the Chinese, but is used by the Mongols. Even an intelligent Chinese postmaster at Ning-hsia Fu did not know of any name for it. Some maps call it Hou-t'ao, but this is the name of a plain north of the Yellow river, and running easterly to the north of the U-la Shan range.

Mr. Carles, in his article on the Ordos (*Geographical Journal* of June, 1909), says that the Abbé Huc passed south of the Da-ba-sun lake to Shih-tsui-tzu, so I must have followed his route for this part of the journey. I have not heard of any other Europeans who have made this journey, though I dare say that Belgian missionaries, who have a large colony at San-tao-ho on the Yellow river (west of the Ordos), and others have been over it. My altitudes were taken with an aneroid, and are therefore only useful as showing the relative heights of places with one another. Entering the Ordos, my aneroid registered 4650 feet, after which there was a gradual

rise of 1160 feet with a fall of 830 feet to the Da-ba-sun lake, then a gradual rise of 1400 feet and a drop of 1270 feet to the Yellow river at Shih-tsui-tzu, where the aneroid showed 5150 feet. The only high hills I saw was a rugged range, called by the Mongols A-ra-bus U-la (the southern part called Ch'i-p'an shan by the Chinese), which bounds the Ordos to the west.

I only found loess in the hills 40 or 50 miles from Shih-tsui-tzu and in the last 7 miles to the Yellow river.

The Yellow river at both ferries is from 400 to 500 yards wide, with a strong current, and as muddy as when it passes through Ho-nan and Shan-tung. I was told that it was proposed to put a Belgian steam-launch on the river to run between Ning-hsia Fu and Ho-k'ou, the port of Kuei-hua-ch'eng, and that the parts were awaiting transportation at Ta-ku. To cross the Ordos once is a matter of interest, but I think only a Mongol, a misanthrope or a madman would care to repeat the experiment.

I again entered civilization at Shih-tsui-tzu (officially called Shih-tsui-shan), a wretched town of 700 or 800 houses in a barren sandy plain. Three or four miles further south, however, I entered a very fertile region, between the Yellow river and the rugged A-la-shan, watered by five canals, which are supplied with water from the Yellow river, and which distribute it through countless irrigation channels over the surrounding fields. Wheat, barley, rice, millet, Kao-liang, beans, linseed, and vegetables are grown. One of these canals dates from the Han dynasty (nearly 2000 years old), another from the T'ang, a third from the present Manchu, whilst a fourth has lately been made from money left by the late General Tung-fu-hsiang, the noted Boxer.

Huang-ch'ü-ch'iao is a busy market town of over 500 houses, P'ing-lo Hsien a wretched city of 400 or 500 houses, and Ning-hsai Fu, 63½ miles from Shih-tsui-tzu, is slowly recovering from the Mohammedan rebellion of forty years ago, and has probably a population of 40,000 to 50,000 inhabitants. Carpet-making is the great industry. Mr. and Mrs. Fiddler (British) and their family are the only European residents.

Whilst in Shan-si I did not see a single poppy, and the opium regulations, a missionary told me, had been obeyed with strictness. Entering Kan-su I found poppy-fields between Shih-tsui-tzu and Ning-hsia Fu. Mr. Fiddler, however, is informed that 90 per cent. less poppies are now grown than formerly in the district.

I found the people most friendly as usual, only occasionally I chanced to overhear a man pointing me out to an unobservant pal as a "foreign devil" (yang-kuei-tzu).

A JOURNEY IN NORTH-EASTERN ARABIA.*

By Captain G. E. LEACHMAN, Royal Sussex Regiment.

THE following is an account of a three months' journey in North-Eastern Arabia, undertaken by the writer in the spring of this year; the original object was to pass by way of Hail in Jebel Shammar through El Kasim to Riadh, but, owing to circumstances which had been to a certain extent foreseen, it was found impracticable to carry out the programme in its entirety. Chance, however, led me to the camp of the Emir of Hail, Ibn er Rashid, who is master of a power which differs greatly from that of any other of the great Arab stocks. An account, therefore, of this journey may be of interest.

The Europeans who are known to have visited the Jebel Shammar Emirate are few in number, the most recent being the late Baron Nolde in 1893, while, previous to him, not more than eight have left any record of their travels. All these came down to Hail from the north or west, and four of them left Jebel Shammar by the Baghdad route, namely, Wallin in 1848, the Blunts in '79, Huber in '81, and Nolde in '93. These travelled by one or other of the three usual routes to Meshed Ali (Nejef) and Baghdad.

In the past winter a section of the great Shammar tribe had crossed the Euphrates into the Jezire of Irak in search of grazing, and their sheikh, on the strength of a former acquaintance, readily permitted me to accompany him and his tribe on their return journey from Irak to the neighbourhood of Hail.

Leaving Baghdad, I joined these Beduin in the tract known as the Shamie, six hours to the west of Kerbela, on January 26; their camp was situated on the edge of the Abu Dibis, a lake which figures in the latest map of Turkey in Asia, published by the Society. The encampment consisted of two hundred tents, composed of members from the four great divisions, or "firka," of Shammar, Abda being in the majority. Moving by short marches in a south-westerly direction, we crossed the district named El Wadian. This, as its name implies, is a flat gravelly desert, cut by a series of wadis running in an easterly or north-easterly direction into the Euphrates valley. The latest travellers to cross the western limits of El Wadian appear to have met with a great number of wadis, but many of these would seem to disappear in the sand or merge into one, for the only wadi crossed by me was the Wadi el Khar,† which the

* Map, p. 348.

† The Wadi el Khar has been discovered by the author, and is an important geographical feature, as it indicates that water can be found at regular intervals between the oasis of Jauf and Nejef in the basin of the Euphrates.

The Wadi el Hisib is of a somewhat similar importance. Huber did not traverse it, but mentions a "depression with good pasturage" in el Wadian. Some

Beduin say has its head near Lubbe in the Nefud near Jauf, and runs into the Bahr en Nejef. The bed of this wadi, which we followed for three days, is generally 4 to 5 miles broad, and after the winter rains water stands in it for some weeks, and water can also be found in it in most places a few feet below the surface of the soil. Apart from this, El Wadian appears to be a singularly waterless tract, and wells were met with but six times in eighteen days' marching.

On February 5 we struck the wells of Samit, which are situated on the most westerly of the routes between Hail and Meshed Ali, marked on some maps as the Derb el Ghazal, a name at the present time unknown to the Arab. This is the longest and least frequented road, but somewhat safer than the others. Wallin followed it coming down from Hail in 1848. At Samit were encamped some Madan Arabs from the Euphrates valley. These Arabs move out into the desert in the spring in search of grazing for their donkeys and sheep (they do not own camels), returning to the river when the heat of summer begins to dry up the spring vegetation. They are, as a rule, better armed than the Beduin, and are a constant source of danger to the caravans of Ibn er Rashid on their journeys down to Meshed Ali. From Samit we more or less followed this road to the neighbourhood of the wells of Hazil, the nature of the country changing and becoming more stony, and intersected by watercourses. A small wadi known as the Wadi el Hisib, running into the Bahr en Nejef, was crossed at El Majamir. At this latter place, in the bed of the wadi, are several hundreds of curious flat-topped mounds; these appear to be of gypsum, from which at some time the surrounding sand has been washed away; many of the mounds are 40 feet high.

All this country is in the "dirat" of the great tribe of the Anaize, that is to say, they have the grazing and watering rights over it. The Anaize are the hereditary enemies of the Shammar, but by one of the curious courtesies of the desert an arrangement had been made with the sheikh of the Amarat section of the Anaize, by which the Shammar with whom I was travelling would be allowed to pass in safety, and there were, in fact, several of the Anaize in the camp. In the neighbourhood of Hazil we met with a party of Slayb, the great news-carriers of the desert, from whom we learnt that the whole of the Anaize tribe with the exception of one section were moving south to attack Ibn er Rashid. Three months previously the Roalla section of the Anaize, who camp in the districts round Jauf, had attacked that town and taken it. Killing Ibn er Rashid's governor, Ibn Sheilan, the sheikh of the Roalla, appointed his son governor in his stead, and proceeded to levy taxes on the inhabitants. The Anaize hoped now to follow up this success by taking Hail itself, assisted by the Amir of Riadh, Ibn es Saud, who was said to be moving

enterprising traveller should traverse the route between Nejef and Jauf, and settle the interesting question as to whether a track leads from one to the other along the Wadi el Khar.

up from the south. On February 12, soon after dawn, we caught sight of the Anaize moving parallel to our march, but, unfortunately, the Roalla, who knew nothing about the above-mentioned arrangement between the Shammar and the Amarat, were marching on the flank nearest us. Their horsemen soon swept down, and by nightfall had seized the whole of the belongings, tents, camels, etc., of the Shammar after a running fight of several miles. My own small party of three managed to get away, and making a circuit to avoid the Roalla, succeeded in reaching the Amarat, whose sheikh, Fahd Beg, received me most kindly. He himself had only heard of the mishap to the Shammar when the fight was over, but he immediately took steps to recover the stock and property, and succeeded in doing so as regards a part of it.

The Anaize, by far the largest tribe in Arabia, were at this time in exceptional strength. The sheikhs repeatedly told me that they could not remember a previous occasion on which the Anaize had marched on a "ghrazzu," or foray, in such numbers. Looking from an eminence, the desert as far as the eye could reach was a moving mass of Arabs, each section moving on its own line. As a rule the mounted men marched in front, behind them coming the thelul riders, while in the middle of them, on a picked "thelul" (dromedary), was the "Mirkab" of the Roalla. This consists of a frame covered with black ostrich feathers, in which a maiden from the sheikh's family rides in battle, exhorting the combatants to deeds of valour. In former times the "Mirkab" was a familiar sight in Beduin warfare, but now the Roalla are the only Beduin in possession of one. Three days after the fight with the Shammar, the great pilgrim road known as the Derb ez Zobeide was reached at Jumeima.* This road, which runs from Meshed Ali *viâ* Jebel Shammar to Medina, is the route which at all times has been used by the pilgrims from Persia and Baghdad. Both the Blunts and Huber marched by it from Hail to Meshed Ali. The road of Zobeide takes its name from the favourite wife of the Khalif, Haroun ar Rashid, who caused reservoirs known as "birkets" and rest-houses to be constructed at intervals along the road for the convenience of pilgrims. These have suffered considerably at different times from invading powers, and especially at the hands of the Wahabis, and now one "birket" alone remains in good condition, and this is at Jumeima. It is constructed in a depression, the water draining into it from all sides, and is made of cemented stone; it is 90 feet square, with a depth of 20 feet, with steps leading down to the water, and troughs round for the watering of animals. When the Anaize reached this "birket"

* El Jemeima. This is the only point at which the author's route crosses that of Huber from Hail to Nejef. The latter mentions here a well-preserved square cistern, about 30 metres square and 4 metres deep, then full of water.

Huber also mentions that, on passing the Shaib Abaruats, a few miles to the south, thanks to the rain fallen during the night (February 9), the valley was filled by a stream 100 yards wide and 2 feet deep.

they had been thirsting for several days, and as it was feared that the supply would not suffice were the whole camp allowed to drink their fill, orders were given that no baggage camels were to be watered, but men and "theluls" only. In many instances these orders were disregarded, and large numbers of thirsty baggage camels were driven down to the water. Exemplary treatment was meted out to the offenders, the sheikhs' sons and servants riding out and firing into the mass and using their swords freely, whereupon the owners were as eager to get their camels away undamaged as they had been before to water them.

At Jumeima news arrived that Ibn er Rashid was two days distant in the direction of Hail, and the Anaize therefore formed their camp in compact lines, instead of in the usual straggling Beduin fashion. In the depression in which the "birket" of Jumeima is situated I counted roughly 3500 tents, which was only a small portion of the whole. Daily there arrived contingents of Arabs from the tribes of the Euphrates valley, who had been brought to join this movement in the hope of loot, an irresistible attraction with the Arab. These tribesmen are not true Beduin, but are infinitely better armed, most of them carrying a good type of Martini carbine; they invariably, however, knock the sights off, as having no use for them. They are of great fighting value from the fact that, being unmounted, they cannot easily run away, which the Beduin is in the habit of doing as soon as things appear to be going against him. These Arabs are of the Madan tribe, and are distinguished from Beduin in that they own sheep and donkeys and cultivate in the season a certain amount of land on the banks of the river. The arrival of parties of Madan was usually heralded by heavy firing, and each party would dance into the camp, and leap about in front of the sheikhs' tents, chanting the battle-cry and discharging their rifles into the air, quite regardless of where the bullets fell. This proved the undoing of the Anaize, for a few days after their arrival at Jumeima, heavy firing was heard in the distance, and was put down to the arrival of new reinforcements, which were expected. It was, however, Ibn er Rashid with his force, mounted on "theluls," each with a "redif," or man, riding behind the driver. He had made a forced march and completely surprised the camp. The Anaize had but time to drive in their camels, and without much fight poured out the opposite side of the camp, followed by masses of women and children on foot, as Ibn er Rashid came in on the other side. The latter swept through the camp, but did not pursue the Anaize, it by this time being almost dark. Early the next morning the camp was looted, and after a short time only the dead animals showed where this huge force had had their tents. As an instance of the good feeling with which Arab fighting is carried out, Ibn er Rashid allowed none to touch the tents of the two chief sheikhs of the Anaize, and after the battle the leader of Ibn er Rashid's fighting men sent a letter to the Anaize sheikh, regretting that he had not had an opportunity of paying his respects to him. The losses,

as is usually the case in Arab fighting, were not heavy on either side; among them was a Shammar youth, who, on hearing that his uncle had been killed, shot himself. I was much struck by the fact that several Anaize women, in passing me in their flight from the camp, thrust upon me their silver ornaments for safe keeping, rather than entrust them to one of their own countrymen.

On this occasion a Shammar who chanced to be in the Anaize camp protected me and my theluls, and I returned with the "ghrazzu" to Ibn er Rashid's camp, which was at ez Zobala, also in the Derb ez Zobeide; but at this place the reservoir has been partially destroyed. The present Emir of Hail is Saud ibn er Rashid, a boy of twelve, son of Abd ul Aziz, who was killed in battle in 1906, his eldest son Mitaab succeeding him; in 1907 he met an untimely end at the hands of his cousin, Sultan ibn Hamud er Rashid, who put to death at the same time the remainder of the family with the exception of the present Emir, who was taken to Medina. Sultan was shortly after murdered by his own brother, Saud ibn Hamud, and he, in his turn, was murdered by his uncle, who then brought the present Emir, Saud, from Medina. This last event took place in the winter of 1908–1909. On arrival in the Shammar camp I was called to the Emir, who was sitting in audience in a great tent with the regent, Zamil ibn Sabhan, by his side. Saud is a handsome little boy with beautiful features and very fair. He is a fine horseman, riding being in fact his only amusement, and being but a child he becomes very weary of the long sittings in the "maglis," where tribal affairs are discussed at an inordinate length. He exhibits at times a most violent temper, which, with his features and other characteristics, he seems to have inherited from his father, Abd ul Aziz. Zamil ibn Sabhan, the regent, is a man of thirty-four, but, in spite of his youth, is probably a stronger man than the Ibn er Rashid Emirate have seen for many years. He is largely responsible for a very great change that is taking place in the position and character of this Central Arabian power.

The Emirate of Hail may be considered to be at a very low ebb at the present time. During the whole of his reign, Abd ul Aziz er Rashid was engaged in a struggle with the Emir of Riadh, chiefly over the question of the possession of the district of El Kasim. Though at times successful, this warfare was an immense drain in men and horses; even now among the Hail folk there are few who do not carry the marks of this struggle in the shape of wounds. This has had such a weakening effect that the Amir has found his influence over his own and surrounding tribes waning. His present policy, or rather that of Zamil, is a policy of conciliation; this is chiefly to be observed in the change in the religious inclinations of the people, and it is certainly a fact that they have quite dropped the strict Wahabi tenets that were formerly prevalent. A few years ago smoking was a punishable offence, and though there was probably a certain amount of smoking in private, it was never seen in public. At the present day

tobacco is practically used everywhere, and privileged persons smoke even in the diwan of the Emir, and on one occasion Zamil himself smoked a cigarette in my presence in his private tent. He also once played a Turkish game of cards with me. In their dress also they no longer affect the simplicity dictated by the Wahabi, but wear clothes richly embroidered with gold and interwoven with silk.

The relations of the Emirate of Hail with surrounding powers have also undergone a change. The old disregard for the Ottoman power has given place to professed sentiments of cordiality, and communication is kept up constantly with the Porte; in speaking of the Porte, Zamil always named it "doulatana," our government. As is always the case in Arabia, the relations of Ibn er Rashid with the great Beduin stocks are constantly changing, but at present the Ateiba, the tribe between Hail and Mecca, appear to be friendly, as are portions of the Beni Harb between Hail and Medina, and also a section of the Umteir in the direction of Koweit. Mubarak ibn Sabah of Koweit professes a friendship which cannot be very great, considering that at present he and Ibn Saud of Riadh, the perpetual enemy of Hail, are comrades in arms. Saidun Pasha, sheikh of the Muntefik, and also the Beduin tribe the Dhafir, both from the East, are friendly to Hail.

Notwithstanding a conciliatory attitude toward the surrounding tribes, the Emir does not hesitate to deal in a summary manner with refractory sheikhs. In his recent struggle with the Anaize, the chief sheikh of the Beni Harb, who, in Zamil's opinion, should have supported him, waited until he saw that the Shammar had gained the upper hand, and then came into the Shammar camp to offer his congratulations. Zamil immediately put him into horse shackles and confined him in the tents of the slaves, threatening to execute him if a certain ransom was not received; this threat would undoubtedly have been carried out had not the ransom—200 theluls and 25 caste Arab mares—been forthcoming. And this man was the great sheikh of one of the most formidable tribes in Arabia.

Previous travellers to the Jebel Shammar have remarked the cordial relations existing between the townsfolk and the Shammar Beduin. Though this feeling is still strong, one can imagine that it is not what it used to be, and now the people of Hail, and even the family of Ibn er Rashid, seldom speak of the Beduin in anything but a tone of contempt; at times also very serious differences of opinion arise between the townsfolk and the Beduin, usually over a question of the division of loot. It has long been the custom of Emirs of Hail to spend the winter in the desert in districts round Hail, taking this opportunity to make "ghrazzus" on refractory subject tribes or enemies. To form a force one male is taken from each house in the towns, or in the case of a large family two or more; these are provided with a thelul, arms, and food, and are paid 10 reals (about 16 shillings) a month during the time they are absent from their

homes. They are allowed to keep all loot taken, with the exception of theluls and horses. Beduin subjects of Ibn er Rashid can accompany him on a "ghrazzu" or not as they choose. The majority prefer to go with him. These receive no advantages except that they are allowed to keep half the loot taken by them. A large part of the force is made up of slaves and servants of the family of Ibn er Rashid, who are excellently armed and generally mounted on horses.

While in the field discipline and general arrangements are of a comparatively high order. In the early morning a crier announces a move of the camp, and the standard-bearer unfurls the flag, and when the latter mounts his thelul, the whole force moves off headed by three purple standards of Hail, one for the Emir and one for each of the quarters of the town. In camp the tents, which are of white canvas and not of black hair like those of the Beduin, are always pitched in the same formation. Scouts are out constantly in search of enemy, water, or grazing. An armourer with a fair knowledge of his work is kept busy doing repairs to the extraordinary variety of arms, for which he is paid by the Amir. In battle the Beduin thinks little of the fighting and much of the loot, but the Shammar are kept in hand till the enemy are beaten, and then only are they allowed to loot. Prisoners taken are beheaded, though sheikhs are often spared. Hospitality on the "ghrazzu" is most lavish. On arrival, a guest is received by a magnificent personage in a gold coat, Abdulla ibn Feraik, hereditary standard-bearer to the Ibner Rashids. His is a powerful though dangerous position, as he must always be in the forefront of the battle. Abdulla, a man of thirty-five, has no less than ten bullet wounds in his body. The guest is then led to a special tent and regaled with coffee until the Emir receives him in the public diwan. If a man of position, he is given a private tent, and provided with everything he desires, and even eats from the Emir's dish. Other guests are fed in a special tent, their number seldom being below sixty or seventy. Amusements in camp are few, mimic warfare being the chief one. This is always led by the Emir in person, who gallops among the tents, lance in hand, followed by his band of horsemen. At night the conversation in the diwans is of a most enlightened character, chiefly consisting of battle stories or family history, while a poet usually recites or intones a "kasid," or poem. These poets are men who wander from tribe to tribe composing "kasids" in honour of the sheikhs and receiving gifts in exchange; this is nothing more or less than a form of blackmail, as, if not well treated by a sheikh, they compose poems ridiculing him in other camps.

The Hail folk are most strict in their observance of prayer. "Muezzins" call at the usual hours in different parts of the camp, when all form up in various places, when absentees are noticed and often beaten. In spite of the fact that they are strict Moslems, they are not fanatical, being in this quite the reverse of the bigoted riverain Arabs of Irak. In the course of a stay of five weeks with the Emir, I hardly heard one offensive remark

about Christians, and in the "meglis," if at any time one asked me questions concerning religion, he was invariably silenced by the sheikhs, and Zamil, the regent, himself, when repeating for my benefit, as he often did, extracts from the holy books, always asked first if I had any objection. The mullas, of whom there were a large number with the "ghrazzu," had no hesitation in coming to my tent and drinking coffee or eating food with me, and when I left the Emir, many of them came to bid me good-bye. They were fond of impressing upon me the fact that though they would eat food with me, they would not do so with a Shia.

During this time the "ghrazzu" moved by short marches about the district known as the Hejera. This is a calcareous stony tract lying between the Nefud and the Shamiye. It seems well provided with water, and must have been at one time the seat of a large fixed population, as in many places there are remains of stone houses. These are, as a rule, perched upon a ridge overlooking a well, and are in clusters of thirty or forty. The walls appear to have been cemented, and the roof is beehive-shaped. The Arabs say that they are from a time previous to Islam, and that the inhabitants died of starvation.

In the middle of March the ghrazzu left the Hejera and camped at the famous wells of Leina,* lying in the valley between the Nefud and the Hejera. The wells at this place number some hundreds, spread over an area of 5 or 6 miles. They are bored in hard white stone, and as many of them, though of a depth of 20 to 30 feet, have a diameter of only 2 feet, it is difficult to understand how they were originally excavated. In the neighbourhood are the ruins of many stone houses. Leina is on the road known as the Derb es Selman, the most easterly of the three routes from Hail to Meshed Ali. There we met the Haj, or pilgrim caravan, returning from Medina to Meshed Ali (Nejef). Owing to the unsettled state of the country, pilgrims had not been able to use this road for six years, preferring the longer route by Damascus, or else travelling by sea from Baghdad. As the Haj is a source of considerable profit to Ibn er Rashid, as well as to the townsfolk of Hail, he was endeavouring to popularize this route by allowing pilgrims to travel through his country at a minimum of cost. In former times it was the habit of the rulers of Hail, when once they had got the pilgrims in their clutches, to delay them until they had extracted the last coin from them. This year, however, Ibn er Rashid had only taken 2½ liras (about 45 shillings) from each member, and

* The wells of Leina have not been previously visited by a European traveller, although Huber passed some miles to the west of them. He mentions being told by his Arab attendants that the wells of Leina were not dug by mortal hands, as no one could be found who could penetrate rock as hard as metal. It was Solomon, the son of David, who, passing along that route one day, fell athirst, and ordered the "afrit" or demons to dig him wells in an hour's time. But even with the most strenuous exertions they could only accomplish the task in two hours, so hard was the rock. Wallin also heard that these wells, and others in the district, were made by Suleiman ibn Daud, aided always by the complacent demons.

besides this, the hire of a camel from Medina to Meshed Ali (Nejef) is about 17 reals (about 51 shillings), so the cost compares well with passage by sea, or by road by way of Syria. The majority of this Haj are Persians, for whom the Arab has the most supreme contempt, as one who cuts but a sorry figure upon a camel.

After parting from the Haj, the "ghrazzu" entered the Nefud, here known as the Dahana. This sandy desert is separated from the Hejera by the valley in which Leina is situated, which is about 10 miles broad. Out of this on one side the Nefud rises abruptly with an escarpment 150 feet high, while on the opposite side of the valley the Hejera terminates in a cliff of a similar height. At this point the sand of the Nefud is not of any great depth, and in places the rocky strata underneath are uncovered. The sand appears to the eye to be of a light red colour, almost yellowish, but the Arabs say that it is both heavier and redder here than towards the north. The usual rolling dunes are found here with their axes north and south. The intervals between the crests are rarely more than 1000 yards, and the difference in height between crest and trough from 100 to 200 feet. The Nefud has a great attraction for the Beduin, especially in the spring months, when it provides grazing far superior to any other district, and even in summer it provides dry grass for the camels. This year, owing to exceptional rains, the Nefud was covered with grass and weeds growing to a height of at least a foot, while many familiar forms of flowers, such as dandelions and daisies, gave it a bright appearance. A bush known as "arfuj," much appreciated by camels, is very common, and also a tree called "sidr," a species of acacia, growing to a height of 6 feet or more, and considered the best wood for fuel in Arabia.

I had repeatedly begged Zamil to send me to Hail, distant about three days, but he put me off with the excuse that the road was not at present safe. He probably never had any intention of allowing me to go, and finally sent for me early one morning, and bade me leave at once with a caravan for the neighbourhood of Zobeir, near Busra. He pointed out that both my life and goods were in his hands, and that he would be quite within his rights in taking either or both. Judging from the experiences of the most recent travellers in these parts, I wonder that he took nothing from me; indeed, the sheikhs used to send daily for various possessions of mine, but they were at all times most careful to return them; hints were, of course, thrown out that certain things would be acceptable. After most friendly farewells, I left the "ghrazzu" and travelled with a party of Shammar going down to er Khamisie, between Zobeir and Suk esh Sheyuk, on the Euphrates, to buy food. Travelling very fast, we left the Nefud, passed across the Hejera, and entering the "dirat" of the Dhafir Beduin traversed a featureless gravelly country to the camp of Saidun Pasha, Sheikh of the Muntefik, a large and powerful tribe inhabiting the southern part of the Jezire of Irak. He was in a war camp awaiting the attack of Mubarak ibn Sabah, Sheikh of Koweit, and Ibn

Saud, Emir of Riadh. These had attacked him a few days previous to our arrival, and had been beaten off with heavy losses, heavy at least for Arab warfare, as I counted nearly a hundred bodies on the battlefield itself, and many must have died afterwards. It was reported that Mubarak and Ibn Saud were advancing again, and there were incessant alarms, when there was an immediate sortie of warriors in the direction of the expected attack. During my stay with Saidun Pasha I witnessed an occurrence which I have not seen mentioned before by travellers. In a previous fight between the Dhafir and the Anaize, a man of the Dhafir was captured, and in the ordinary sequence of events would have been killed. The Sheikh of the Dhafir, however, had made a last attack and rescued the man; the latter waited until the Dhafir reached the camp of Saidun, and one night rode slowly through the tents mounted on a thelul, singing two lines of a "kasid" describing his rescue, and of which the refrain ran, "I whiten the face of Ibn Suwait" (Sheikh of Dhafir and his rescuer). The Arabs say this form of recognition of a valiant action, though well known by tradition among them, is rarely seen.

After being most hospitably entertained by Saidun, I marched to the Euphrates in the neighbourhood of Samawa, whence I passed through the Shia Arabs of the riverain plain to Baghdad, experiencing a certain amount of the boorish treatment for which these sectarians are notorious.

During my journey I encountered at all times a number of that curious people the Slayb, about which so little seems to be known. It is a curious fact that the Arabs appear to be as interested in their origin and characteristics and as ignorant concerning them as Europeans. I have heard Arabs inquiring from Slayb as to their religion, asking if they are Christians, and receiving a not very indignant denial. They are usually met with in small parties of half a dozen men with women and children. They avoid as much as possible known watering-places, and have therefore become famous among Arabs for their knowledge of the country. They usually have donkeys only, but some have camels. They dress in one long smock-like garment made out of gazelle-skins with a hood, and when hunting, in which they are most extraordinarily expert, they usually cover up their heads with this hood, and it is said can approach within a few yards of a herd of gazelle without alarming them. Arabs speak of the comparative luxury in which these people live as regards food, and say that they always have "flesh to eat and leben (sour milk) to drink." They appear to wander over a very extensive area, and the only Arab I have met with who do not know of Slayb in their "dirat" are the Kahtan from south-west Arabia.

NOTE ON MAPS ILLUSTRATING DR. STEIN'S EXPLORATIONS IN CHINESE TURKESTAN AND KANSU.*

By Dr. M. AUREL STEIN.

The maps published herewith are intended to illustrate the explorations which were carried on by me during the years 1906–08 in Chinese Turkestan and westernmost Kansu under the orders of the Indian Government, and with the special assistance of the Survey of India Department, and of which a preliminary account has been furnished by me in the *Geographical Journal* for July and September, 1909. They comprise a general map (I.) of the area over which the explorations of those years extended, between the approximate longitudes 75° to 101° E., on the natural scale of 1 : 3,000,000; and two maps, on the scale of 1 : 1,000,000, showing important mountain regions within that area, viz. portions of the Kun-lun range south of the Karghalik-Khotan-Keriya line (II.), and portions of the Western and Central Nan-shan between the longitudes of Yü-mên-hsien and Kan-chou (III.). The general map contains also insets showing, on the natural scale of 1 : 1,000,000, the geographically and archæologically interesting region through which the remains of the ancient Chinese frontier wall extend, from the desert west of Tun-huang to the vicinity of Yü-mên-hsien (A, B); as well as the oases of Chira, Gulakhma, and Domoko (C), on a scale 1 : 500,000 between Khotan and Keriya, which along with the adjacent desert tracts may claim a similar interest.

These maps have been reduced from the map in 94 sheets, drawn on the scale of 4 miles to 1 inch or 1 : 253,440, and each extending over one degree of latitude and longitude, respectively, in which the Trigonometrical Survey Office, Dehra Dun, under the direction of Colonel S. G. Burrard, R.E., F.R.S., has embodied the results of the surveys effected by my topographical assistants and myself. These sheets, at present in course of reproduction by heliozincography at the Trigonometrical Survey Office, Dehra Dun, are intended for publication, in the form of an atlas, with my detailed Report on the scientific results of my journey. They will also be utilized by the Survey of India for the preparation of its "Trans-frontier" degree sheets of those regions. At the time when the present reduced-scale maps were being drawn the sheets of the 4 miles to 1 inch map were available for reference in outline proofs only, not showing as yet the hill shading. The latter along with certain other details had, therefore, to be supplemented from the tracings retained by me of the original plane-table drawings. In addition, the surveys effected on my previous journey in 1900–01, and already shown in the maps attached to my paper in the *Geographical Journal* for December, 1902, and to my *Ancient Khotan* (Oxford, 1907), have been utilized for filling in certain portions of the ground shown in the extreme west of the general map as well as small areas in Map II., re-visited in 1906–08, but not

* Maps, p. 348.

re-surveyed. The only features shown in the present maps and taken from sources other than the original surveys of my journeys are certain portions of the Tarim, Kashgar, and Charchan river courses, which for the sake of clearness were added (in broken outlines) from the maps illustrating Dr. Sven Hedin's explorations, and a number of triangulated points in the mountains south of Keriya which were inserted by the Trigonometrical Survey Office from its early Ladak triangulation records and Captain Deasy's observations of 1898–99.

The map sheets prepared by the Trigonometrical Survey Office and here reproduced on reduced scales are based principally upon the plane-table surveys carried on continuously in the course of my travels by my topographical assistants and myself. These were supplemented by astronomical observations for latitude and by triangulation as described further on. Rai Sahib Ram Singh, Sub-Assistant Superintendent, Survey of India, worked with me from the time when we entered Chinese territory in May, 1906, on the Taghdumbash Pamir, down to September, 1907, when he had to be invalided to India from An-hsi. His place was then taken by Sub-Assistant Superintendent Rai Bahadur Lal Singh, who shared in my subsequent explorations until we re-crossed the Chinese frontier in October, 1908, on the Kara-koram. Both, before joining me, had a record of many years' surveying experience over wide and varied ground, Rai Ram Singh having previously worked in Chinese Turkestan and Tibet with the expeditions of Captain Deasy, Majors Ryder and Rawling, and myself, while Rai Bahadur Lal Singh's twenty years' surveying labours had extended practically over the whole of the Trans-frontier regions within the range of Indian interests from the Yemen to China proper. For the trained skill, devoted industry, and unflagging zeal which they brought to bear upon their tasks, carried on often under extremely trying conditions, I feel bound once more to record here my high appreciation.

The plane-table work was done throughout on the scale of 4 miles to 1 inch, and in accordance with the methods employed by the Survey of India for "reconnaissance survey" work. On mountainous ground no efforts were spared to establish plane-table stations on commanding heights above passes and route lines, elevations up to close on 20,000 feet being climbed by us in the Kun-lun for this purpose. In the desert plains of the Tarim basin, where it was often difficult to fix positions by intersections or triangles, the exact measurement of the marching distances, invariably made with a cyclometer, proved particularly useful in traversing.

For the purpose of securing points to check the plane-table traverses, astronomical observations for latitude were made by my assistants with a 6-inch transit theodolite wherever the available time and the weather conditions permitted of them. A list printed below shows those 72 points for which the computed latitudes were utilized by the Trigonometrical Survey Office in the compilation of the map sheets. In addition to these use was made also of the latitude observations which had been obtained

in the course of my journey of 1900–01 for numerous positions in the western and south-western portions of Chinese Turkestan then surveyed.

The work of securing these observations was beset with serious difficulties, both on account of the climatic conditions prevailing and the rapidity of movement necessitated by considerations for my other scientific tasks and by the wide extent of the area to be covered. In and along the deserts of the Tarim basin and of the Su-lo-ho drainage the frequent periods of dust-haze proved as great a trouble in this respect as the cloudy and rainy weather encountered during most of our work in the Nan-shan ranges. The rapid succession of daily marches, often over 25 miles in length, may be gauged from the fact that during the two years and four months actually spent on Chinese soil there were 488 shifts of camp, the aggregate of the marching distances for the same period amounting in my own case to close on 8300 miles. In addition, it must be remembered that what time could be spared for prolonged halts had to be devoted mainly to exacting archæological labours, generally at desert sites. Observations for longitudes were practically precluded by such conditions of travel.

In order to extend the area covered by our surveys, I detached the topographical assistant from my own party for independent work whenever the available routes, means of transport, etc., and considerations of other tasks allowed this. During these periods of detachment, which on occasions extended to over two months, I carried on the plane-table work along my own routes myself. The comparison of the positions indicated by our traverses at the points where the surveyor's and my own route-lines crossed or joined, furnished a useful means of checking the results. Wherever we moved together, the work on the plane-table was done under my direct supervision and with my assistance. The record of local names along our common routes was invariably effected by myself. For routes followed only by my assistant, I used every effort to check and correct the record of local names brought back by him through the independent examination of natives acquainted with the ground.

In this connection it may be stated that in the transcription of Turki and Iranian names I have followed the system of phonetic transliteration approved by the International Congress of Orientalists, and used, in a simplified form, for Indian Government publications. No use, however, has been made of diacritical marks. In each case I endeavoured to record the form of the name as actually pronounced by the local inhabitants, refraining from any attempt to spell the name in accordance with its correct Turki etymology. I am aware that this method of record has led in some instances to obvious inconsistencies; but I considered it the safest in the case of a geographical student like myself, who, though an Orientalist and familiar with the spoken language of Eastern Turkestan, do not profess to be a Turkologist. In the case of Chinese local names, I took the precaution of having them written down on the spot also in

Chinese characters by Chiang-ssŭ-yieh, my Chinese literatus. For the subsequent transliteration of the names thus recorded, according to the officially adopted Wade system, I am indebted to the kind help of Mr. L. Giles, of the British Museum.

For the purpose of obtaining a framework of triangulation for at least portions of the ground surveyed, bases were measured by Rai Sahib Ram Singh, first in the Tash-kurghan valley below the Taghdumbash Pamir, and subsequently in the outer hills of the Kun-lun, south of Keriya. These were connected with trigonometrical points accepted by the Survey of India and originally determined by the Pamir Boundary Commission and Captain Deasy, respectively. The very inaccessible character of the ground encountered in the Tash-kurghan river valley lower down prevented, in the first instance, any further extension of the triangles. But the work started about Polur proved very successful, and enabled Rai Sahib Ram Singh to extend a series of triangles in direct connection with the Indian triangulation system eastwards along the northernmost range of the Kun-lun to a point well beyond the Charchan river, *i.e.* from circ. 81° 40′ to 86° 48′ E. long. This triangulation was carried out in the late autumn (of 1906), when, as usual, the atmospheric conditions of this region were better than at other seasons. But the great cold then prevailing at the high elevations where the triangulation stations had to be established, severely taxed the surveyor's physical endurance, and renders the success achieved by him all the more creditable.

It was hoped by me at one time to carry this triangulation right through to Tun-huang and the westernmost Nan-shan. But the rheumatic illness contracted by Rai Sahib Ram Singh in the course of the operations just referred to, and other reasons obliged me to keep my whole party with me when travelling in the winter of 1907 from the Lop-nor region to Tun-huang, and the desert route then followed precluded any attempt at further triangulation. Mischance of another sort—damage to a theodolite level, which could not be repaired at the time—prevented Rai Bahadur Lal Singh, in the spring of 1908, from effecting the intended triangulation along the southern main Tien-shan range from the neighbourhood of Aksu westwards to Kashgar, for which I had deputed him. We were, however, more successful in the rugged high range of the Kun-lun, near the previously unexplored headwaters of the Khotan river, where a number of elevated stations could be connected by triangulation with the Ladak series of the Indian Trigonometrical Survey. A chart of observed bases and triangles, along with a complete list of trigonometrically fixed points, will be published with the maps on the scale of 1 : 253,440.

Apart from heights measured by theodolite vertical angles in the course of triangulation, elevations were obtained from observations of two Watkin mountain aneroids of the Survey Department, which were checked at regular intervals with mercurial barometers and, as judged by this test, preserved a very uniform rate of index error. Neither of the mercurial

barometers survived the journey; the second, however, remained in working condition to within two months of the conclusion of exploratory work. In addition hypsometrical observations were made by me with two boiling-point thermometers, which, along with a mountain aneroid and half-chronometer, had been kindly lent to me by the Royal Geographical Society's Council. Clinometrical readings to prominent heights were regularly taken in the course of plane-table work on mountainous ground, care being taken on high elevations to obtain clinometer readings with preference from points where the use of the mercurial barometer was practicable for observation of absolute heights. The clinometric heights recorded in Map III. for the Nan-shan are based largely on such observations.

According to information kindly furnished to me by Mr. J. Eccles, M.A., Superintendent, Survey of India, who, in succession to Captain H. H. Turner, R.E., supervised the compilation of the original map sheets from the above materials, the representation of the area south of the line Kashgar—Yarkand—Khotan—Charchan is based on the trigonometrical points secured by Captain Deasy's work and on my journeys of 1900–01 and 1906–08. As regards the north-western portion of the area shown in Map I., the compilation rests on the position previously determined for Kashgar and that newly obtained for Aksu by our plane-table traverses from Khotan, Kashgar, and Yarkand. The values given by these three traverses differed so slightly from each other that it was decided to adopt their mean, though this implies, for the position of Aksu, a considerable shift in longitude to the east as compared with the position accepted in former maps. In compiling the rest of the area, it was found that the plane-table traverse between the easternmost point fixed on a trigonometrical base and Kan-chou required considerable correction in longitude, for over-estimated measurement of direct distances (here mainly on a line from west to east), in order to agree with the longitude of Kan-chou, as hitherto accepted by the Survey Department. Another plane-table traverse made from Keriya to An-hsi to close the circuit gave a somewhat more satisfactory result. It was decided to retain the old longitude of Kan-chou and to adjust the intervening topography accordingly, with due regard to the astronomically determined latitudes.

In conclusion, I wish to express here my sense of deep obligation to the Survey of India Department, which, under Colonel F. B. Longe, R.E., Surveyor-General, by its generous help in the matter of trained assistants, instruments, and money grants rendered possible the execution of my geographical tasks on the scale above recorded. I owe much gratitude in particular to Colonel S. G. Burrard, R.E., F.R.S., Officiating Surveyor-General, who, as Superintendent, Trigonometrical Surveys, by his unfailing interest and experienced advice, greatly facilitated both the work in the field and the elaboration of its results in his office.

List of Astronomically Observed Latitudes.

Camp.	Latitude.	Place.
	° ′ ″	
1	37 51 27	Chushman.
5	37 50 40	Udurghuk.
7	38 5 42	Toile-bulung.
11	38 30 42	Karghai-aghzi.
12	38 40 9	Ighiz-yar.
19	38 23 59	Chini-bagh, Yarkand.
21	38 28 17	Bagh-jigda (Beg's house).
24	37 24 1	Kŏk-yar.
26	37 3 20	Kosh-yüz-öghil.
42	36 26 50	Pusha (Shamshel Mazar).
44	36 30 4	Tashte-öghil, Kurat Jilga.
46	36 39 5	Camp below Ashpak.
49	36 15 46	Foot of Kashkul glacier.
57	36 21 8	Jigatal, Kochkar-bashi.
60	37 1 12	Kotaz Langar, Sampula.
63	36 34 50	Toghrak Langar.
68	36 21 49	Sokterek.
69	36 24 41	Camp near △ station above Achchan.
72	36 30 53	Kara-bulak.
75	36 36 21	Malghun.
89	36 36 29	Kuchkach-bulaki.
99	37 14 5	Ile-dong, Kapa.
99	37 14 53	Gold-pits, Kapa.
103	38 8 21	Charchan Bazar.
106	37 52 24	Kara-tash Sai.
110	38 20 2	Camp on Yol-Sai.
124	40 31 14	Stupa of ruined site, "Lou-lan."
125	40 34 30	Camp near temple ruin, "Lou-lan."
147	39 59 31	Panja springs.
152	40 29 41	Besh-toghrak well.
154	40 19 35	Toghrak-bulak.
159	40 8 9	Tun-huang town, garden outside south gate.
164	40 25 45	Ruined watch-tower, T. XXVIII., of ancient *Limes* N.E. of Tun-huang.
168	39 54 39	Nan-huo, central hamlet.
172	40 8 16	Springs south of ruined watch-tower, T. VI. b.
178	40 2 37	Ch'ien-fo-tong; monks' residence near south end of cave temples.
181	40 22 7	Kua-chou-k'ou.
182	40 31 38	An-hsi, temple outside west gate.
184	40 19 40	Chiao-tzŭ, large temple within walls.
188	39 49 3	Camp ½ mile north of Shih-pao-ch'êng.
193	39 51 45	Ch'ang-ma, temple within main village.
197	39 53 35	Temple of Ch'ing-tsao-an-tzŭ.
200	39 48 16	Chia-yü-kuan, outside east gate.
201	39 45 6	Su-chou, Chiu-chüan temple outside east gate.
203	39 25 27	Chin-fo-sŭ, garden 1 mile to south of east gate.
207	38 59 54	Ta-pên-ko, gold-miners' camp.
211	38 54 54	Spring in side valley of Pei-ta-ho.
223	38 38 31	Camp on river-bank below Fêng-ta-fan.
227	39 9 24	Sha-ho-kou, river-bank outside east gate.
228	38 55 41	Kan-chou, temple outside S.E. corner of city.
231	39 20 3	Chien-ch'uan-tzŭ.
237	40 5 34	Ch'ih-chin-sê, rest-house near N.W. end of village.
245	41 33 40	Ma-lien-ching-tzŭ.
248	42 2 50	K'u-shui.
252	42 48 44	Hami, garden on west bank of river.
259	43 6 33	Taranchi.
262	43 29 10	Tung-yen-tzŭ.
265	42 51 56	Pichan, Beg's house outside west gate.
267	42 39 7	Chong-Hassar ruin.
274	42 55 39	Turfan, S.E. quarter of Chinese town.
287	41 44 32	Korla, main bazar.
288	41 55 48	Ruined site of Ming-oi, Shikchin.
295	41 14 38	Camp Jigda-sala.
299	41 14 39	Inchike-gumbaz (ruined tombs).
309	41 42 58	Kuchar city (near Yamên).
322	39 18 19	Dead tamarisk cone 4 miles N. of Camp 323, ancient delta of Keriya river.
327	38 41 43	Camp on new Keriya river-bed.
330	38 23 13	Tonguz-baste, shepherds' hut.
350	37 14 18	Ulugh-Mazar.
367	38 3 5	Camp Malghun on Kara-kash river.
369	38 27 12	Mazar-tagh, left river-bank below hill.
371	39 0 4	Camp Ayak-ŏstang.

THE DISCOVERY OF CHRISTMAS ISLAND.

By WILLIAM FOSTER.

WHO was the first European to sight and name Christmas island (the one in the Indian ocean, not that in the Pacific), and what was the date of the event? A writer in the new edition of the 'Encyclopædia Britannica'—basing himself on Mr. C. W. Andrews' excellent monograph of the island—assures us that nothing is known on either point, and that the earliest appearance of the island is on a Dutch map of 1666, under the name of *Moni*. This lends a special interest to some passages I recently came across in the India Office records, which show that the island was known twenty-three years earlier, and that the honour of its discovery may fairly be claimed for a British navigator.

The first of these passages occurs in a letter (*O. C.* 1868) addressed to the Honourable East India Company on May 20, 1644, by Captain William Minors (or Mynors, as he signs himself), in the course of which he narrates the homeward voyage of his ship, the *Royal Mary*. He left Bantam on December 9, 1643, but was delayed in the Sunda straits, first by contrary winds, and then by the necessity of filling his water-casks. On Christmas Day he came in sight of an unknown island, of which he gives the following account:—

"The 25th ditto [December, 1643] in the morneing I saw an island, of which I cannot find any mention either in English, Dutch, or Portugall platts. It lyes in lattytude 10d. 27; S. ¼ E. from the head of Java, distance 75 leaugs; and longitud from the said head 00d. 31 E. To see to, tis a fine smooth island of 7 leaugs longe. I came not neerer it then 6 leaugs, but caus'd the lead to be hove but found noe ground. There I lay becalm'd two dayes; which did heartyly greeve me, in regard of the many sicke men I had then aboard, beinge noe less then 20. But the 29th ditto it pleas'd God to send a fresh gale."

Minors does not say what name he gave to his new discovery. This information, however, is supplied by another document, viz. a log kept on board the *Royal Mary*, now forming vol. 65 of the India Office Marine Records. In this the writer says, under date of December 24–25, 1643, "At 3 howers morne had sight of an iland bearing, the body of it, S.W. b. W. about 7 lea. of; and because it was Christmas Day we called it by the name of Christmas iland."

A further reference to the island, though under a slightly different name, occurs in a letter (*O. C.* 1871) written by Ralph Cartwright, ex-President of Bantam, who went home at the beginning of 1646 in the same *Royal Mary*, with Minors again as her commander. The vessel passed Java head on January 11, and Cartwright tells us that "The 13th about noone we saw Nativity Iland, soe called by Capt. Mynors. The 14th we had sight of the iland againe."

The real latitude (10° 25′ S.) and longitude (105° 42′ E., while Java

head is 105° 13′ E.) of Christmas island correspond very fairly with Minors' calculations; and so does its distance from Java, viz. 190 miles. He rather exaggerates the length of the island; but then, as he tells us, he only saw it from a distance.

It may be added that William Minors was one of the many East India Company's seamen whose merits have never been sufficiently recognized. Fuller, in his 'Worthies of England' (ed. 1811, vol. 2, p. 308), says of him that "he hath safely returned eleven times from the East Indies, whereas, in the dayes of our grand-fathers, such as came thence twice were beheld as rarities: thrice, as wonders: four times, as miracles." He was born at Uttoxeter, in 1593, and died at Hertford, after some years of retirement, in July, 1667.

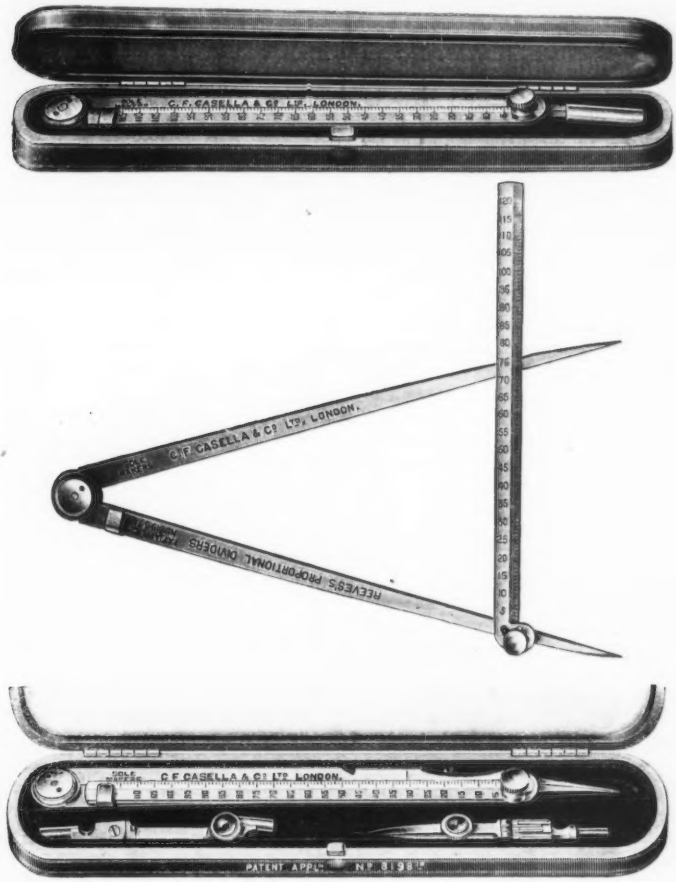
NEW PROPORTIONAL DIVIDERS FOR MAP DRAUGHTSMEN AND OTHERS.

By E. A. REEVES.

A SIMPLE little instrument, which has already been found useful to many, has recently been devised by me for surveyors, cartographers, engineers, architects and draughtsmen of all kinds. It consists of an ordinary pair of compasses or dividers, fitted with a movable scale, by means of which latitudes and longitudes can be accurately scaled off maps and charts, proportional measurements made, and lines divided into any number of equal parts, or divisions having a proportional increase or decrease in length. It will also serve as a diagonal scale or vernier for exact measurements of various kinds, and can be put to numerous other uses. As will be seen from the illustrations, it is neat and compact, and the special arrangement does not interfere with the use of the compasses for ordinary purposes. For geographers and map draughtsmen one of the principal uses of the instrument is that for scaling off latitudes and longitudes on maps when, as often happens, the divisions on the projection or borders of the map are not sufficiently close for accuracy. At present this often entails a somewhat tedious process of subdivision before the exact latitude or longitude can be found, but with this instrument it can be done at once with considerable accuracy. Suppose, for instance, the latitude to be required, and that the projection is marked off to single degrees only. The graduated scale is set to any convenient position and clamped. Then the compass is opened until the inner edge of the leg that is not attached to the movable scale coincides exactly with the 60th or 120th division. After this, the instrument is placed flat on the map with the divided scale as nearly parallel as the eye can judge with the meridian line passing through the position on the map of which the latitude is required, and with its two inner edges exactly on the two extremities of the whole degree on the projection. The leg of the compass to which the scale is attached is then held firm, while the other one is moved until it cuts the position on the map required, when the scale reading is noted, which will give the minutes and divisions of a minute of latitude.

Another important use to which this instrument can be put is that of finding the exact proportion that any section of a line bears to the whole. This is performed as before described, with the exception that the leg of the compass is set to the 100th division on the scale instead of to 60th or 120th. Readings can then be taken off to two decimal places, or three by estimation.

For marking off the meridional parts when constructing a chart on Mercator's Projection, in which there is a proportional increase in the lengths of the divisions, these dividers will also be of special service. In this case the operation is generally the same as in the others, but instead of the dividers being held so that the divided scale is parallel with the line to be divided, they are so placed


C.F. CASELLA & Cº LTD. LONDON.
C.F. CASELLA & Cº LTD. LONDON.
REEVES'S PROPORTIONAL DIVIDERS
C.F. CASELLA & Cº LTD. LONDON.
PATENT APPLIED FOR No. 8198

that this scale forms an angle with the line. Many other uses for the instrument might be mentioned.

These Proportional Dividers are made by Messrs. Casella & Co., of 11–15, Rochester Row, S.W., and vary in price from £1 5*s.* 6*d.* to £2 5*s.*, according to length, and whether they are merely dividers or made to carry pen and pencil points as well. An explanatory pamphlet is supplied with the instrument.

SALINITY IN THE NORFOLK BROADS.

I. ON THE CAUSE OF THE SALINITY OF THE BROADS OF THE RIVER THURNE.*

By MARIETTA PALLIS, Newnham College.

THE investigation on the cause of the salinity of the broads of the river Thurne was started by my friend Miss J. S. Shaw and myself, during the time that we were making a joint ecological survey of the Norfolk Broads District. Miss Shaw, however, was obliged to withdraw from the work before it was finished, and it therefore fell to my lot to complete alone the investigation of which the results are embodied in the present paper.

At the present day the waters of most of the East Anglian broads are to all intents and purposes fresh; there is, however, a system of broads, situated between the sea and the village of Hickling, whose waters have a distinctly saline taste. These salt broads lie in a low and level marshland district which is protected by a chain of dunes from inundation by the sea at high water. They are the following—Horsey, Hickling, Whitesley, Heigham, Blackfleet, and Martham; Horsey, the broad lying nearest to the sea, possessing the saltest waters.

The Thurne, which drains this lowland coastal region, rises close to the dunes near Winterton Ness, and pursues a south-westerly course inland, eventually joining the Bure at Thurne mouth. It draws water from the broads and also from the many drains, or dykes, of the district. This water is pumped by the windmills which abound on the East Anglian fens for drainage purposes. Many of the dykes, like the broads, contain salt water.

In view of the fact that the majority of the broads of East Anglia are now fresh, the comparative salinity of the waters of the Thurne system of broads appeared to be a matter of considerable moment. On *à priori* grounds there appeared to be four possible explanations of the presence of salt. These are as follows:—

(1) That the salt was a survival of earlier geological conditions; or that it merely dated from 1800,* when the last irruption of the sea through the dunes took place.

(2) That the salt was blown from the sea.

(3) That salt water is brought up the Thurne daily by the tides which pass up the Bure from Yarmouth.

(4) That direct underground communication existed between the sea and the waters of the Thurne district. The investigations undertaken point to this last as the operative cause.

As regards the first supposition, it cannot long be entertained as an adequate explanation of the peculiar salt conditions of the district, for it is obvious to any local observer that the continued saltness of the water must depend on the possibility of renewal of the supply of salt, since "outside" fresh water is continually being pumped into the district. This pumping in of fresh water together with the wash of the winter rain would certainly be capable of almost entirely removing the traces of the salt.

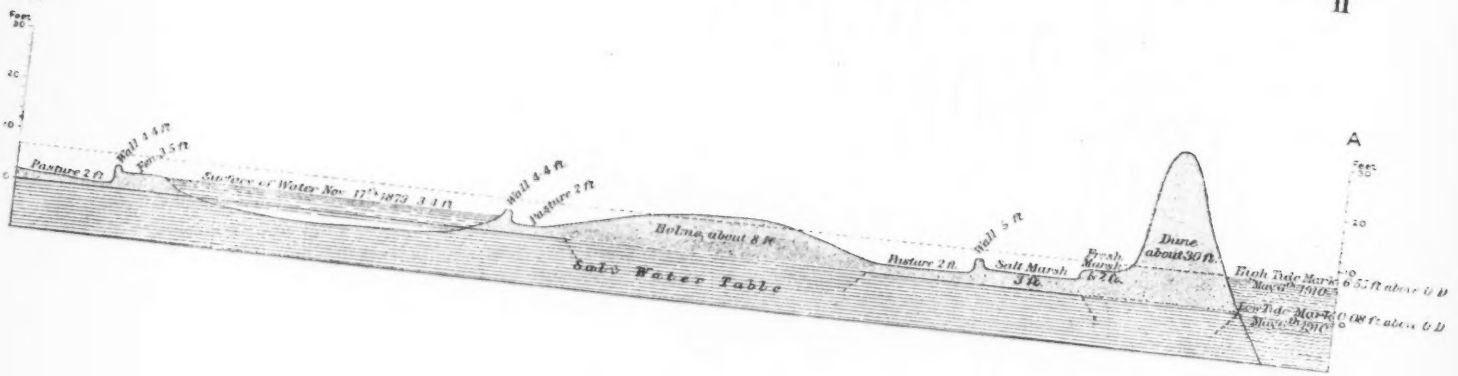
Hardly more tenable than the first supposition is the second one, viz. that blown salt is responsible for the saltness of the waters of the district. To begin

* Research Department, December 15, 1910. Map, p. 348.

† Memoirs of the Geological Survey of England and Wales. 'The Geology of the Country around Norwich.' By H. B. Woodward. Footnote on p. 153.

Section from the Coast taken through Horsey Mere

II



Scale 1·20,000 or 3·17 Inches = 1 Statute Mile

1000 500 0 1000 2000 3000 4000 5000 Feet

Vertical Scale exaggerated 50 times

O.D. = Ordnance Datum

with, the high salinity of the dykes carrying local waters rendered such a view improbable, and, in point of fact, analysis has proved that the waters in the ditches on the holmes or islets of "upland" soil contain only a negligible quantity of chloride as compared with the amount of the same substance in the waters of the marshland dykes, and this in spite of the fact that in many cases the holmes lie nearer to the sea than do the marshes. The comparatively small amount of chloride present in the ditches on the holmes (about 20 parts of chloride in 100,000 parts of water) may be assumed to be due to blown salt.

The third supposition that the salinity in question is due to the passage of tidal salt water from the Bure up the Thurne appeared to be one with regard to which it was more difficult to arrive at a decision. Considerable attention had already been devoted to this question by the staff of the Sutton Broad Laboratory, some of whose conclusions have been published by Mr. Eustace and Mr. Robert Gurney in their account of the Sutton Broad Laboratory.* Mr. E. and Mr. R. Gurney state in their account that under "ordinary conditions the salinity of the river Bure is not affected by the tide further than Acle bridge (12 miles from Yarmouth)." Now, Acle bridge is 3 miles from Thurne mouth, where the rivers Bure and Thurne meet. It is therefore obvious that the salinity of the Thurne cannot be due to the ordinary tidal conditions. Further, Mr. E. and Mr. R. Gurney state that "analyses taken at different points from Thurne mouth upwards show a progressive increase in salinity, culminating in Horsey Mere."

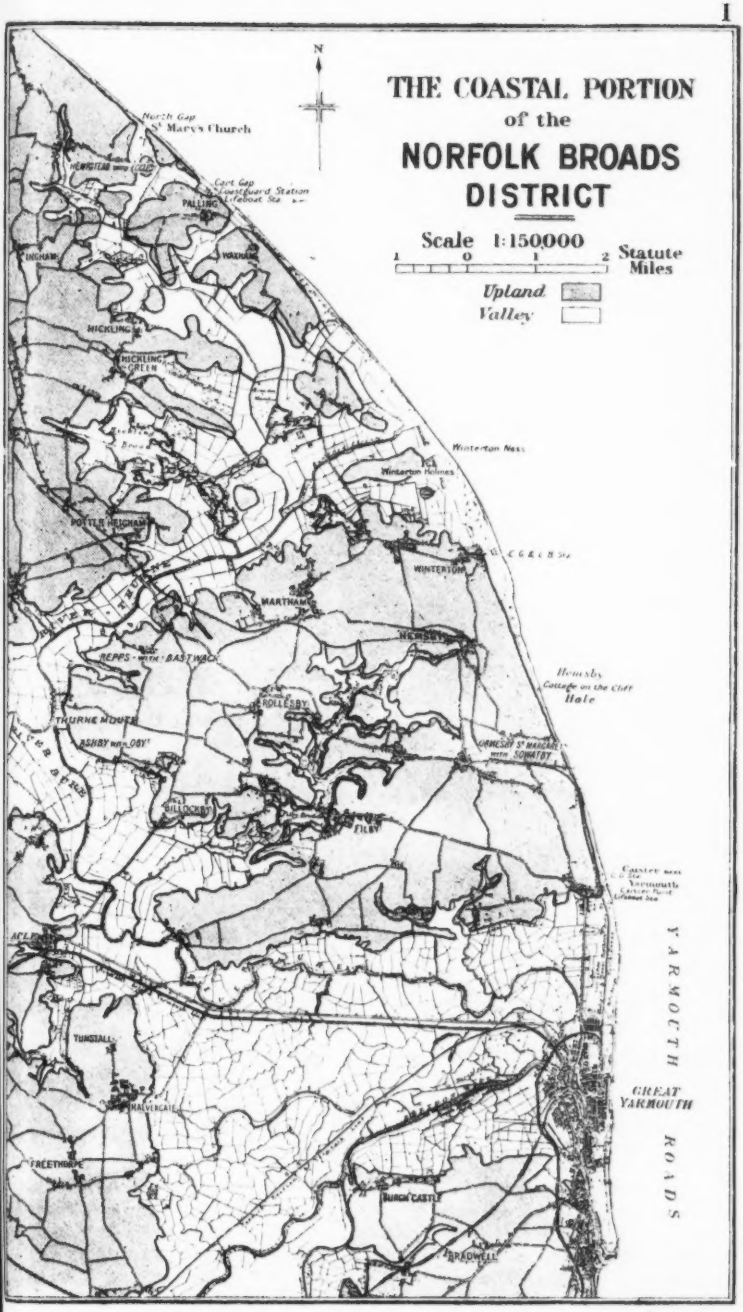
This progressive increase of salt in the river Thurne shows unmistakably that the salinity of Horsey Mere (which, as the saltest broad in the district, may be taken as representative of working conditions) cannot possibly be attributed to the passage of salt water by way of the Bure. Although this conclusion leaves the actual reason of the salinity of Horsey Mere undecided, it is of real value in so far as it points to the fourth hypothesis, viz. that direct underground communication exists between the sea and the waters of the Thurne district, as containing the real solution of the question.

The gradual increase of salt concentration inversely to the distance from the sea, in one direction, constitutes in itself the strongest possible reason for assuming that in the close proximity of the sea, in another direction, lies the real explanation of the salinity of the Thurne district. The only alternative explanation for the salinity of Horsey Mere is one suggested, although without any attempt at proof, by Mr. Eustace and Mr. Robert Gurney in the following words: "There can be no doubt that this high salinity is due to the existence of salt springs in Horsey Mere, and probably also, to a less extent, in Hickling Broad."

In so far, then, as Mr. E. and Mr. R. Gurney's published conclusions are concerned, they appear to regard Horsey Mere as the point where the maximum salinity is reached. Whether Horsey Mere was the real culminating point or not could only be determined by continuing the analyses already undertaken to a point in more immediate proximity to the sea. Investigations were accordingly begun at the source of the Thurne, or Hundred stream, as it is also called, close to Winterton Ness, where the point of highest salinity is reached (at least 850 parts of chloride in 100,000 parts of water).

Now the river Thurne has several small branches, all of which rise close behind the dunes. One of these branches marks the parish boundary, and is distinguished as the main branch of the river. This branch contains, close to its source, only about 225 parts of chloride in 100,000 parts of water, whereas the other branch

* 'The Sutton Broad Fresh-water Laboratory, 1908.' By Eustace and Robert Gurney.


THE COASTAL PORTION
of the
NORFOLK BROADS
DISTRICT
Scale 1:150,000
1 0 1 2 Statute Miles
Upland
Valley
N
North Gap
St Mary's Church
Cart Gap
Lifeboat Sta.
PALLING
HICKLING
HICKLING GREEN
Winterton Ness
Winterton Holmes
POTTER HEIGHAM
WINTERTON
MARTHAM
REPPS-WITH-BASTWICK
Hemsby
Cottage on the Cliff
Hale
THURNE MOUTH
ASHBY with OBY
FILBY
ACLE
TUNSTALL
HALVERGATE
FACEthorpe
BURGH CASTLE
BRADWELL
YARMOUTH
GREAT YARMOUTH
ROADS

contains, at the same point and at about the same distance from the sea, about 850 parts of chloride. This seemingly anomalous fact pointed to the probability of the existence of *a difference in level of the beds of the branches of the Thurne*, and when the levels were read by a surveyor, this proved to be the case, for the bed of the main branch of the Hundred Stream was found to be 3·08 feet above O.D., whereas the bed of the more saline branch was only 0·87 foot above O.D. The level of low tide, of which a reading was also taken at Winterton, was 0·08 foot above O.D.—that is to say, the bed of the salt branch lies only 0·79 foot above average low-water mark.

It is these observed facts which supply the key to the situation, for they show that there is a salt-water table * in the Thurne district which is practically coincident with the level of the sea at low water, and which moreover contains most salt close to the sea. It is therefore inevitable that all the broads and dykes which cut into this level should be salt. This may, at any rate, be accepted as a potential fact, although it is true that in certain cases the presence of the salt water may be largely masked by the presence of fresh water.

If holes are dug at different points on the marshes between the sea and Horsey Mere, salt water is met with at about low-tide level, and not only is this the case, but water in holes dug close to the dunes shows a very much higher salinity than the water further inland, and is, in fact, *almost as salt as the sea itself.*

Sea	3100 chloride in 100,000 parts of water.
Hole about 70 yards from the dune	2840 chloride in 100,000 parts of water.

To sum up, (1) there is a salt-water table in the coastal region where the broads connected with the river Thurne lie; (2) this salt-water table appears to stand in actual relation with the permanent level of the sea, *i.e.* the level of the sea at low water, both with regard to origin and position; and (3) the broads and dykes of the district owe their salinity to the presence of this layer of salt water.

From what has been said, it is apparent that the district is fundamentally saline; salt water is not, however, invariably found at low-tide level owing to the presence of fresh water which, subject to certain more or less definite conditions, also occupies a permanent place in the district. The fresh water may, therefore, be regarded as a modification of the fundamental saline character of the district.

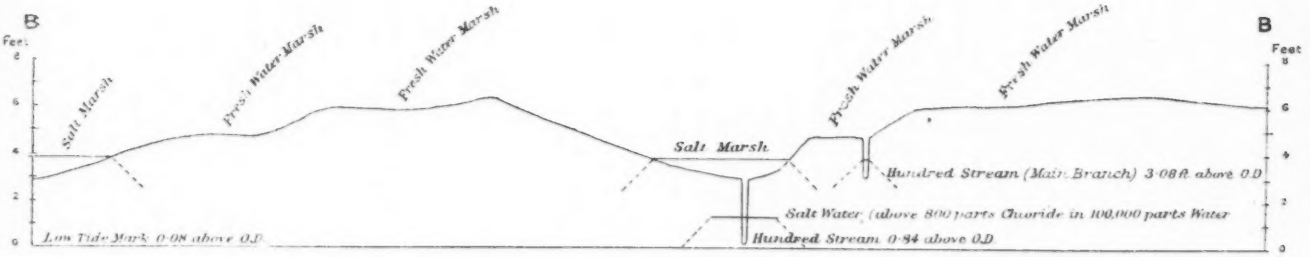
The relation of the fresh water to the salt-water table is threefold, and depends, generally speaking, upon whether the salt-water table is subaerial or subterranean. In the first place, the fresh water lowers the general concentration of the salt-water table throughout the district. Secondly, it produces local variation in concentration in particular areas; and, thirdly, its presence results in a lowering of the level of the salt-water table where the latter happens to be subterranean.

The map accompanying this paper illustrates the distribution of the various concentrations of salt met with in the waters of a portion of the salt district in question. On looking at the map, one of the first things which may be noticed is the great want of uniformity in the salt concentration as shown by the Arabic numerals. These numerals refer to the proportion of chloride present in 100,000 parts of water, and range from 20 to 2840—that is to say, some of the water contains many times less salt than an amount which can be detected by taste, whereas

* The term "salt-water table" is used in a somewhat loose sense, viz. as meaning, in some cases, merely a salt-water layer, since there is, naturally, no sharp line of separation between the salt water and the fresh water, where layers of both are present. The salt-water table, owing to various causes, which will be alluded to further on, is, in fact, a wavy curve.

Section to show the Distribution of Salt and Fresh Marsh close to the Dunes

IV



Scale 1:12,000 or 5·28 Inches - 1 Statute Mile

1000 500 0 1000 2000 Feet

Vertical Scale exaggerated 150 times
O.D - Ordnance Datum

some approaches the sea in saltness. Not only is this variation absolute for the entire district, subject to the modifying influence of weather, but it is also particular, *i.e.* this same variation may range over certain circumscribed areas within the district. The absolute variation is indicated on the map by a series of monochrome shades, and the particular variation by the combination of two monochrome tints in a chequer. On Brograve level, there is one more or less uniform salt concentration, and this is indicated on the map by the single shade, whereas the marshes close to the dunes where the variation in concentration is specially noticeable are shown as a chequered area.

The want of uniformity in concentration of the waters of the district which the index numbers indicate is, however, more apparent than real. This becomes evident when the determining cause of the presence of the fresh water is investigated.

This inquiry resolves itself into tracing the sources of fresh water in the district, which are (1) position; (2) "outside" water, pumped in by the mills; and (3) variation in level of the land surface.

It is by position close to the upland that the uniform freshness of the waters of marsh areas is accounted for. For example, the strip of marsh bordering on the Brograve level has uniformly fresh water owing to the fact that the water there is not the local alluvial water, but is, properly speaking, "upland" water, so that the variation in concentration here introduced into the marsh area is really extraneous. The same criticism applies to such "outside" water as is pumped in, but the effect produced in this case is different, and is, in fact, practically equivalent to the effect produced by the natural cause, viz. the variation in level of the land surface.

In neither of these cases, either as regards the "outside" water or that dependent upon the natural land surfaces, is the distribution of fresh water uniform. The fresh water is restricted to definite dykes and levels, and consequently the most diverse salt concentrations may exist side by side in different dykes, and are even sometimes strikingly exemplified in a single dyke, if there happens to be a considerable variation in its different beds. One dyke which rises at a comparatively high level, close to the dunes, has at that particular portion of it only about 25 parts of chloride in 100,000 parts of water, whereas at those parts where its bed is at the same level as the other dykes of the district its waters may contain as much as 400 parts of chloride.

If the dykes containing fresh water are left entirely out of consideration, the waters in the rest of the dykes do not vary more in concentration than do the dykes of other areas shown as uniform on the map, so that in this instance also, as in that previously referred to, where the presence of fresh water was determined by proximity to the "upland," it is obvious that the presence of the fresh water is not a fundamental condition, but one which is secondary and superimposed.

As stated at the beginning of this paper, the marshes are on the whole extremely level; there is, however, a strip of land behind the dunes where the surface is, comparatively speaking, uneven, the levels varying within a limit of 10 feet or so, and in this area the variation in concentration of the waters is particularly high, as will be seen by the Arabic numerals on the map. This unevenness of level is caused by dune sand which has been irregularly spread over this coastal strip of marsh. The unevenness has reacted on the vegetation through the physical and chemical factors involved, so that it is possible by merely glancing at the vegetation, at once to recognize chemical and physical differences, and these chemical and physical differences are in their turn indicators of definite differences in level. Up to about 4 feet above O.D., the approximate level to

which salt water extends, there is salt marsh; from about 4 to about 7 feet there is fresh marsh; and from about 7 feet upwards there is fixed dune, which passes by degrees into travelling dune. Section B illustrates these conditions.

It is, however, not only where the waters are superficial that level, as in the instance just cited, exerts a modifying influence; the same is the case where the waters are subterranean. If a hole is dug through one of the slightly higher spots of a salt marsh area, the water which collects in the hole is considerably less concentrated when the digging is proceeding than in perhaps half an hour's time; and, further, the water goes on gaining in concentration up to a certain limit, which is never so high as the concentration of the water which collects in a hole dug through a lower level of the same salt marsh, even though the holes may only lie a few yards apart. The reason of this is that any deposit in the district, above a definite height, is either partially or wholly a fresh-water stratum. Where the level of the surface is only very slightly above low-tide level it influences the position of the salt-water table only to a very slight extent. Where, however, as in the case of fresh-water marshes, the level is, comparatively speaking, high—that is to say, where the fresh water stratum is thick—the position of the salt-water table may be even below the level of low tide.

Thus, supposing that the whole marsh area were no higher than the level of low tide, it appears probable that it would be entirely permeated by sea-water, and if pumped-in fresh water were excluded, the dilution of the salt water would depend mainly on the rainfall, and since this would affect the district more or less uniformly, the fundamental saline character of the district would not be masked, as it sometimes is under present conditions. Even as it is, if the fresh water on the marshes due to pumping and to fresh-water strata be left out of consideration, the marshes are very uniformly saline, as is shown by the fact that the variation over areas where there is least disturbance of the fundamental saline character is, practically, negligible. It need hardly be said that these salt-water conditions would gradually be modified or cease altogether in proportion to the distance from the sea.

An interesting parallel to the conditions which prevail in the Hickling-Horsey district occurs on the Dutch coast, where a subterranean salt-water layer has, owing to its economic importance, been elaborately mapped. That such a salt-water layer should exist in Holland was rather to be anticipated in view of the fact that there are so many physical features common to the Dutch coast and to the portion of the Norfolk coast which bounds the district of the broads. In Holland the salt-water layer has been mapped in the dune area, as it is from the dunes that the water-supply of many of the towns is drawn.

The important point in withdrawing the fresh water from the dunes is not merely to avoid tapping the salt-water layer, but also to avoid removing too large a volume of fresh water annually, relative to the rainfall, since the level of the salt water seems to depend upon the amount of fresh water present in the dunes, for there are facts which indicate that the salt-water layer most probably rises proportionately to the amount of fresh water withdrawn in relation to the average rainfall. Amongst Dutch engineers the question of the amount of fresh water which may be removed is a matter of controversy.

In conclusion, I wish to express my thanks to Mrs. Bush for the great kindness she showed me while I was working in her house in Norfolk. Mr. Charles C. Perry and Mr. J. W. H. Johnson I most particularly wish to thank—the former for help in the composition of the paper, and the latter for advice and help in various directions. Mr. H. E. de Bruyn and Miss H. L. G. de Bruyn have very kindly discussed with me parallel conditions in Holland.

II. SOME OBSERVATIONS ON THE WATERS OF THE RIVER BURE AND ITS TRIBUTARIES.

By ROBERT GURNEY, M.A.

The East Norfolk rivers are, as is well known, the shrunken remains of what was in historic times a great estuarine system. The mouth of the estuary, which, in Roman times, extended from Caister in the north to Burgh Castle in the south, became blocked by the southerly drift of sand, and with the consequent narrowing of the estuary, the tidal scour was checked, and the great flats then covered by salt water at high tides were reclaimed by embankment, and the rivers confined within their present courses. Their history, their proximity to the sea, and the fact that their evolution is even now proceeding, renders a study of the waters of the broads and of the river Bure of special importance. Realizing this, the Sutton Broad Laboratory has regarded the analysis of the waters and the study of the tides as within the province of its work since the year 1903. In 1906 two expert chemists, Mr. H. Peel and Mr. A. G. Innes, spent some months working continuously at the analysis of the water. Observations have accumulated, but it was not thought advisable to work them up for publication until 1908. Mr. Innes then took the work in hand, and in April, 1910, completed a paper on the subject. This paper will be published in the Transactions of the Norfolk and Norwich Naturalists' Society, but I have been kindly permitted to present here the main results of the work.

The Tides.

It is well known that the action of the tide can be traced many miles up the river Bure, but exact observations appear to have been hitherto wanting. The following facts, excepting those relating to Yarmouth, are the results of work carried out by us by means of recording tide gauges. A full account will be published elsewhere.

The range of tides off Yarmouth amounts to about 6 feet at springs and 4 feet at neaps. At Southtown bridge, below the confluence of the Yare and the Bure, but about $2\frac{3}{4}$ miles above the harbour mouth, the range, taking the average for two complete years, is 4 feet 7 inches at springs and 3 feet 7 inches at neaps. About 12 miles above this point, at Acle bridge, the range of tide is found to be 13–15 inches at springs, and 7–9 inches at neaps. Above Acle the range of tide continues to decrease and the difference between spring and neap tides becomes difficult to detect without prolonged observation, since the variations due to other causes are liable to obscure it. A definite tide of an average range of about 5 inches can be traced at St. Benet's Abbey, about 16 miles from Yarmouth, but above that point the rise and fall of water is increasingly difficult to connect with the period of ordinary tides.

Leaving the Bure and proceeding up the Thurne river, a tide of about 5 inches may be detected at Potter Heigham bridge, and an irregular oscillation of about $1\frac{1}{2}$ inches is found in Heigham Sounds, about $1\frac{1}{2}$ miles from Potter Heigham bridge. Beyond this point our own evidence and that of others is in agreement, namely, that no tide, in the usual sense, can be traced.

This short sketch of the nature of the tides in the Bure and its tributary, the Thurne river, is necessary in order fully to understand the significance of the analysis of the water from the point of view of salinity.

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* Research Department, December 15, 1910.

Salinity of the Water.

In ordinary circumstances a great body of salt water passes up the Bure at every tide, and the water at the Yacht Quay in Yarmouth is usually of a very high salinity, and contains a marine fauna. Of course the salinity is variable, and samples have been analyzed, which showed salinities varying from 416 to 1684 grains of chlorine per gallon. On the other hand, there may be occasions on which so much fresh water is being discharged that the water may have a salinity of as little as 34*, and the fauna may be that of fresh water.

Proceeding up the Bure, it can be proved that the salinity normally remains high for several miles, but that there is a point at which there is a sudden drop, and this point is the limit to which salt water normally penetrates. It has been proved that no tidal change of salinity can be detected in normal circumstances higher than Acle Bridge, about 12 miles from Yarmouth, and this fact is in accordance with theoretical expectations. For example, a series of seven analyses were made at various times between June 7 and 9, 1906, in the Bure at Muckfleet, and in each case the salinity was found exactly the same, namely 9·8.

This conclusion, namely, that Acle bridge marks the limit of range of sea-water, was stated by us in 1904, and is established both by the evidence of Mr. Innes and by that of Dr. Otto Hehner, and Mr. C. Hawksley for the Yarmouth Waterworks Bill of 1906.

Above Acle the salinity of the water is still somewhat above that of pure fresh water, and this salt must be derived from some source other than the sea. In order to make the explanation clear the waters of the Thurne river must be examined. If one proceeds up the river, taking samples of the water on the way, it is found that the salinity increases the further one proceeds from the mouth.

For example, on September 12, 1906, Mr. Innes found the salinity at the mouth 5·73. At Potter Heigham bridge it had risen to 23·67, at Candle dyke to 28·57, and in Hickling Broad to 46·2. In Horsey Mere the salinity was 53·8. These and many other analyses taken at other times prove that the Thurne river is salt at its source. There is clearly a large amount of salt water finding its way by percolation through the soil into Hickling Broad and Horsey Mere, and the salinity of these broads may be as great as 78·4 and 164 respectively. As a consequence of their high salinity these broads contain species of Crustacea, which are usually found only in brackish water. These species are *Neomysis vulgaris*, *Gammarus duebeni*, and *Corophium grossipes*. I have recently found the prawn *Palæmon squilla* in Heigham Sounds, and it is probable that both it and *Palæmonetes varians* occur in Hickling and Horsey.

We have here, then, an isolated group of broads having a highly saline water which is drained into the Thurne river. This water passes down, becoming less salt as it receives the fresh water drained off the marshes, and finally mingles with the water of the Bure itself. The latter, before it reaches Thurne mouth, is a fresh water containing about 5 grains of chlorine per gallon, and is characterized by the great quantity of floating microscopic vegetation in the form of Algæ and Diatoms contained in it. At Thurne mouth, however, it receives a large volume of saline water, so that the water below this point is of a higher salinity than that above it. Owing to the oscillation of bodies of water to and fro caused by the tide the contrast is not always clear, since the mixed water is of course driven back by the flood tide to some distance above its entry. A true picture of the *régime* of the waters of the Thurne river can only be presented by

* All references to salinity must be read as so many grains of chlorine per gallon.

means of tables and figures, but it must be stated that the conclusions given above could be fully substantiated in that way.

Coming now to the waters of the Ant, which enter the Bure by St. Benet's Abbey, about 16 miles from Yarmouth, it is found that the salinity, though never very high, presents certain problems which still await solution. For above Barton Broad, in the river, and in Sutton Broad, the salinity is normally very low, namely, 3–4 grains per gallon; yet in Barton Broad there is a rise to 6–7 grains, and, below that point, the river water has a salinity of 7–8. Mr. Innes concludes that there is a percolation of sea water into the broad as there is at Hickling, but the point seems to require further research. The high salinity cannot be due in normal circumstances to a reflux of water form the Thurne river, since the water of the Bure at Ant mouth is generally of a lower salinity than that of the Ant. The salinity, both of Barton and of Sutton Broads, is variable, and that of Sutton may reach 7 grains without apparent cause.

It is worth noticing here that the water of the broads of the Ant does not contain the rich plankton fauna of the broads of the Bure itself. There is a noticeable scarcity of Diatoms and Algæ, and the planktonic *Daphnia cucullata* has only been obtained on one or two occasions. These broads agree with those of the Thurne river group in the abundance of Chara, a plant which is rarely found in the Bure system, and this fact seems to point to a possible community of origin of the water of both. It is true that of late years the great beds of Chara, which used to luxuriate in Hickling, for example, have to some extent disappeared, but this seems to be due to the invasion of that broad by a green alga allied to Zygnema in the first instance, and later by a species of Cladophora, which covers the bottom with a thick carpet which must smother all other vegetation.

In normal circumstances, then, we may state that the pure waters of the upper Bure receive on their passage by Ant mouth a slight access of salt water. At Thurne mouth they receive a great volume of highly saline water, and the mixed water is driven back by the flood tide nearly as far as Horning, the excess of salinity over that of pure fresh water from Horning down to Acle being due to the discharge of the Ant and the Thurne river. At some point below Acle the river takes the character of an estuary in the sense that it receives water from the sea.

Abnormal Tides.

The tides on the East Coast are well known to be largely affected by wind, and exceptionally high tides may be expected when strong northerly winds prevail. On such occasions the water is prevented from ebbing, and the next flood tide comes in with the water already standing at or near the level of ordinary high water. High tides so caused, rising occasionally as high as 12 feet in place of the usual 6 feet, naturally drive an immense body of salt water up the rivers. One such tide occurred on March 13, 1906, and raised the salinity at Horning to 287, which is equivalent to 22 per cent. of sea-water. Normal conditions were not restored till after March 22 at Horning, and the effect was traceable up the Ant as late as March 30.

It seems probable that the effect of such tides on the river depends a good deal on the level of water in the river at the time, the effect being the greatest when the level is lowest. For this reason much smaller tides than that above mentioned may drive salt water up. An 8-foot tide at Yarmouth suffices to influence the salinity of the Bure in the summer as much as an 11- or 12-foot tide at other times. Thus, on July 7, 1903, the tide reached 8 feet 3 inches on the gauge at Yarmouth. On July 13 the salinity at Sutton Broad was 9·8, about a mile below Barton 112·6, and at Ludham bridge 384·4. On the other hand,

in the Bure at Ant mouth it dropped to 191, showing that normal conditions are more rapidly restored in the Bure than in the Ant. At Thurne mouth the salinity was 538·7, and here the fauna, while comprising a few specimens of fresh-water Crustacea, was composed of marine species, such as *Centropages hamatus*, *Acartia discaudata*, and the Ctenophore *Hormiphora*.

As showing how suddenly such changes may occur, I may give as an instance the tide of September 4, 1910. Unfortunately no chemical analyses were made, so that the evidence is almost wholly zoological.

At Stokesby on September 3, at 12.45 p.m., the floating fauna was that of pure fresh water, including even the rotifer *Conochilus volvox*. On the other hand, twenty-four hours after, at 12.30 p.m. on September 4, high water being at 8.30 a.m. at Yarmouth, not a single living specimen of a fresh-water species could be found, their place being taken by a rich marine fauna, including the Tunicate *Oikopleura* and numbers of marine Copepods. The water the following night was brilliantly phosphorescent owing to the presence of Noctiluca. Faunistic conditions remained the same till I left the place on September 7, when the salinity of a sample taken at 10 a.m. was 705, but it was evident that the influence of fresh water had begun to re-establish itself on the previous day, since fresh-water weed was found drifting down the river.

These conditions show the unstable conditions which prevail in the Norfolk broads, and that though, as a general rule, they are entirely beyond the direct influence of sea-water, yet at certain times the old estuarine conditions re-establish themselves.

The CHAIRMAN, Prof. MYRES (before the paper): The paper this evening is by Miss Marietta Pallis, of Newnham College, on the "Cause of the Salinity of the Broads of the River Thurne," and I will ask Miss Pallis if she will be good enough to give us a brief verbal account of the principal points contained in the paper, and indicate to us the questions on which she would most desire that the discussion should turn.

The CHAIRMAN (after Miss Pallis's paper): Since Miss Pallis's paper was circulated, we have received from Mr. Robert Gurney a paper on "Some Observations on the Water of the River Bure and its Tributaries," which I think will come in very appropriately here, and I should like to ask Mr. Gurney to give us the substance of those observations of his before we come to more general discussion.

Dr. C. E. MOSS: The problem that has been put before us can be approached from various standpoints. I do not pretend to speak from the geological or engineering standpoint, but only from the botanical point of view. It appears to me that Miss Pallis has given a very satisfactory explanation of some difficult and curious facts with regard to the distribution of maritime species in the Thurne district. The maritime species in this district are quite different from those that occur locally on mountain-tops in various parts of North Britain, not merely because they are far more general in the Thurne district, but because the species which occur here are much more thoroughly maritime. Several of the species that occur throughout the Thurne district are, so far as this country is concerned, otherwise absolutely limited to the vicinity of salt marshes. Miss Pallis, in her investigations on the distribution of these species, has been led into a study of the cause; and it does seem to me that her explanation carries conviction. There is one question I should like to ask Miss Pallis. I gather from what she says that the salt-water table sinks underneath the sand-dunes. Now, we often

get marshes among sand-dunes, but, as a rule, the plants of the dune-marshes are fresh-water species. Sometimes, however, we do get in dune-marshes a few maritime species, and I was wondering whether the same explanation would apply to these as to the maritime species of the Thurne district ?

Prof. F. W. Oliver : Like Dr. Moss, I am a botanist, and welcome any geological generalization which affects phenomena near enough to the surface of the Earth to influence the vegetation ; to this extent we are considering a botanical contribution. Dr. Moss asked a question about the sand-dunes, and I should like to put another of somewhat the same character, one which I think it is extremely probable, from her own observations, Miss Pallis will be able to answer. It is purely a botanical question, touching the behaviour of certain elements in the vegetation. There seems to have been in the past a certain amount of difference of opinion amongst plant geographers on the question whether or no sand-dunes are subject to what are called halophytic conditions. If one consults current text-books, in the one case you will find that the plants of the sand-dunes are described as approximating in the conditions of their growth to the inhabitants of the salt marsh. On the other hand, among American writers, and to some extent among investigators in this country, we find that entirely denied. I remember Dr. Blackman examining samples of dune sand from 2 feet above H.W.M.S.T. at Erquy, and, if I remember rightly, he could detect no traces of salt in that soil, and his results were corroborated by other chemists working two or three years later on the same system of dunes. The question I wanted to ask was whether Miss Pallis found that salt reached the growing organs of dune plants in any way through the agency of the salt table ? Now, that very common dune plant, Psamma, as every one is aware, is provided with a mechanism whereby its leaves will roll up under certain conditions. Ordinarily, so far as my own observation goes, the leaves of Psamma are found spread out flat, and in a position favourable to the maximum evaporation of water. But if you pluck a leaf, within five minutes that leaf will be rolled up into a cylinder. It is commonly asserted in the books that deal with these matters that this mechanism comes normally into operation, and that the plant is thereby protected against excessive drought as might occur upon the dune. However, I have never myself seen a Psamma *in situ* with its leaves rolled up, and I was wondering whether the presence so near below the surface of this salt table would under certain conditions bring that mechanism into play, and in a sense justify the possession of a mechanism of that kind. It is possible, in the system of dunes north of Winterton, to which reference has been made this evening, that observations bearing on that point might perhaps be available. In conclusion, I have only to say that what we really want now is a *précis* of the distribution of the plants and of the animals over the same area. When they are ready, I hope it may be possible for some account of those results to be given here under the auspices of the Royal Geographical Society, who on so many occasions have extended welcome hospitality to topics brought forward by botanists and by zoologists.

Dr. O. V. Darbishire : It would be very interesting to follow up the few observations made by Miss Pallis and Mr. Gurney in regard to the occurrence of algæ in the rivers of the coastal portion of the Norfolk Broads. Brown marine algæ have been known to establish themselves in quite fresh water by gradually moving in from the sea. This can be observed in the case of the bladderless form of *Fucus vesiculosus* at Rostock, or the gradual spread of marine algæ in the Kiel canal. But algæ cannot grow on a sandy or muddy river-bottom. It would be interesting to determine exactly the species of Cladophora found in the waters of the Hundred stream at the point of its highest salinity. Is it a marine or a fresh-

water species, or even only a local variety of either? The determination at different seasons of the cryptogamic flora of the waters under discussion might afford some important additional evidence as to the history of the latter. I would also like to answer, if I may, a question put by Prof. Oliver. Sand-dunes contain very little salt indeed. The outermost dunes formed by the seawheat (*Triticum junceum*), which are at least occasionally washed by the sea, contain of course the highest percentage of salt. But the first real sandhills bearing the marram grass (*Psamma arenaria*) contain throughout mere traces. Hansen found that the pure sand of the strand dunes and of the humous sand of the dune valleys were both quite free of any salt at Borkum.* Warming, quoting from Masclef, finds that in the strand dunes 0·351 per cent. sodium chloride can be detected, 0·17 per cent. at a distance of 150 metres from the sea, and only 0·041 per cent. at a distance of 1500 metres.† My own analyses at Birkdale showed 0·2125 per cent. for the outer dunes, and 0·0065 per cent. for the sand well inland bearing marram grass. The marram grass is therefore a blown-sand plant, a psammophyte, and it is not in any way a halophyte, under the influence of the saltiness of the sea. It is easy to understand that any salt present in the tide-free area of the sandy district will very readily and rapidly be washed down by the rain. This will take place probably long before the sand has been piled up even to a height of only 5 or 6 feet.

Dr. Owens: The part of Miss Pallis's paper which interests me most is the search for the explanation of the salt. Referring to the tides, it has been pointed out by one speaker, there may be up to 13-feet rise during a very high spring tide on this coast, and it is reasonable to think that if there is a connection between the sea and the broads under the sand-dunes, there would be more salt in the water of the broads during the spring tides than during the neap tides.

It would seem to follow from this that a map, to be accurate, should represent the salt contained at one particular time, and I should judge that that is almost impossible to obtain. It would imply samples being taken from all the various points at the same moment, as there might be a considerable variation in the distribution of the salt at different states of tide. What I would suggest is that the observations made should be related to the state of the tide; some observations should be taken at very high springs, and similar observations at the low neaps, and the results compared. If these observations were taken over a sufficient area, the distribution of the salt during high springs might point to the source, as a connection between the sea and the broad. That is, if at a certain place, the water was very much more saline during springs than during neaps, then it would be reasonable to say that that is the place where the water gains entrance from the sea; also, if no such variation in salinity were found it would tend to support Miss Pallis's "salt-table" explanation. Last summer I made some observations on a little broad on the Norfolk coast at Holme, where I was spending my holiday. There was a very remarkable variation in the salinity there with the height of the tide. The broad was fed by a connection to a river which passed by into the sea through a sluice. The sluice was protected by a tidal valve, which leaked more or less, with the result that salt water gained access to the broad when the valve closed at H.W. With that in view, I expected, during high spring tides, with the leakage from the sea, to get a higher salinity in the broad than during the neap tides; but I found exactly the reverse. It was

* Adolphi Hansen, 'Die Vegetation der Ostfriesischen Inseln,' pp. 56, 57. Darmstadt: 1901.

† Englers *Botanische Jahrbuecher*, vol. **31**, 1902, p. 582.

a great surprise to me. During high springs, the broad water gradually rose in level until, after the highest spring tide, the water-level attained a maximum, but then the salinity was at its lowest. I did not determine the degree of salinity; the variation was so very great that during the high spring tides the water was almost fresh, and during the low neap tides the broad became very salt, the amount of water in it reduced, and you could not use soap to wash in it. The explanation, then, of the salinity being due to percolation from the sea, does not seem to cover the point in this particular broad, although there was a known leakage at the tidal valve. One would suggest, then, that it might be due to the presence of salt in the subsoil. I know that that particular broad was inundated by the sea about eleven years ago; but only for a short time, and it might be suggested that that is where the salt comes from. I can hardly believe this; the river which feeds the broad is perfectly fresh water; it flows into the broad during every high tide and flows out again, so that it seems probable the salt would have been washed away.

I should like to ask Miss Pallis if she can suggest any explanation which would fit the case. It is a broad of about half a mile long, and an average of about 100 yards wide; the average depth, I suppose, is not more than 18 inches. I mention the depth because somebody will suggest the possibility of the sea-water settling to the bottom. It is tidal in a secondary sense; that is, the tide shuts the valve which allows the river to flow into the sea, and it then flows into the Broads.

Mr. G. D. Johnston: The sea frequently used to break through and flood the marshes at Horsey. One of the most serious inroads occurred in 1791, when several gaps were made in the dunes, the widest being 200 yards long. Other incursions have taken place subsequently, the last being, as far as I am aware, in November, 1897, when all Horsey marshes were overflowed.

The Clerk to the Commissioners of Sewers, in giving evidence before the Royal Commission on Coast Erosion, said that the Hundred stream used to discharge at Horsey through a gap in the sandhills known as "the long Breach," which was closed by the commissioners by an artificially raised sand-bank. I suppose this was done when the commissioners were originally constituted in 1608. Before that time the marshes must have been covered by the sea every high tide.

Prof. Myres: I think we shall be very grateful to Miss Pallis for having introduced this subject, and we shall also thank Mr. Gurney for his contribution to the matter. Before I ask Miss Pallis to reply, I should like to make one or two small observations. The first is a question suggested by the contrast, in the data supplied by the map entitled "Distribution of Salt Waters," between the seaward and the landward sides of the northern extension of the salt "concentrated" area east of the district marked Waxham. On the seaward edge of the lowland area the concentration ceases abruptly against the upland. On the other side there is a much more gradual transition. Miss Pallis referred to that, I think, in passing, but perhaps, for the benefit of those who are not very familiar with these problems, I might ask her to explain rather more fully how it comes that there is not a greater inshore dilution of the saline water round the fringe of the Waxham upland. Is it probable that the island is not so large as to contribute enough fresh water to effect that? The same question arises to a certain extent round the holm where Horsey village stands.

Another point arises there: is there any evidence as to the composition of the subsoil of these holms, and as to whether the holm subsoil extends outwards, or what its distribution is under the margin of the marsh areas? and is the distribution of comparatively fresh water correlated at all with that really geological circumstance? My former point arises again there in regard to the

contribution of fresh water from the small isolated uplands. What is the local effect of rain round the margin of the holms? That, I imagine, might quite readily be tested either by watching existing wells or shallow pits, or perhaps even by sinking one or two small shafts and testing the water both after drought and after rain.

Then Miss Pallis referred to the economic effects of the infiltration of salt water in the case of Holland. She alluded, as one of these facts, to the problem which resulted for the Dutch engineers who are engaged in organizing water-supply for Dutch cities and towns. One would like very much to know from Miss Pallis, also, whether, in practice, the vegetation of these salt-affected areas is liable to be affected in any way which increases or diminishes their practical agricultural value; and whether, as arising out of these series of inquiries, there is any practical moral for the farmer in this or in similar districts, either here or in Holland?

Mr. Gurney's contribution showed, I think, pretty clearly that this phenomenon of salt-concentration is not confined to the broads at the headwaters of the Thurne, but extends to other similar pieces of water rather further inland, and I hope it will be possible for some inquirer to make a check series of observations round, I think, Sutton Broad, which is surprisingly far inland to be affected in this curious way. I am sure I am expressing the wish of all members of the Department who have heard this paper, in hoping that we may sooner or later have from Miss Pallis, and also from Mr. Gurney, data as to the effects of this salt-distribution on the distribution of fauna and flora, as soon as those investigations are completed.

Miss Pallis: Dr. Moss wants to know what effect the salt has on the vegetation? Well, where there is a considerable amount of salt there is salt-marsh vegetation; but all over the district, even where there is no salt, *scattered* specimens of salt-marsh plants occur. Actual salt-marsh vegetation occurs only where there is a considerable amount of salt close to the surface. Analyses have shown that in the dune marshes the amount of salt is negligible, so that the presence of maritime species there is evidently independent of the present distribution of the salt.

Prof. Oliver wanted to know whether the salt water might not on occasion reach the roots of Psamma. I should not think so, because on the landward side of the dunes both fresh-water marsh and fixed dune intervene between the salt marsh and the travelling dune, on the latter of which the Psamma occurs. Whenever the water from the fresh-water marsh has been analyzed very little chloride has been found—from about 20 to about 36 parts of chloride in 100,000 parts of water. On the seaward side the sea does not, in most places, approach the base of the dunes closely, even at spring tides. Near Winterton Ness, where the sea approaches the base of the dunes exceptionally closely, there is very little Psamma at present at the base of the dunes. The dunes close to Winterton Ness have, however, been recently built up, which may possibly account for the scarcity of Psamma.

With regard to Dr. Owen's remarks, I do not quite understand what are the conditions he has spoken of. Does the sea-water actually reach his broad by the flap which regulates the outflow from the broad?

Dr. Owens: The flap opens at low tide by the pressure of the fresh water, and is kept closed at high tide by the pressure of the sea-water, but there is at all times a leak in of sea-water.

Miss Pallis: Well, the explanation I should give then is, that, since at neap tides there is less water in the broad, the effect of the salt-water table, if there is

one, would be more apparent than at any other time. When there is little rain in the coastal broads district the salt water is more apparent than at other times. The question is not merely connected with more or less dilution, for the condition in time of drought is a salt-water table minus the superimposed fresh-water table, and the increase in salinity is too great to be put down to evaporation. As a matter of fact, I should very much like to see that broad, and see exactly what the conditions are.

Dr. Owens also asked, I think, whether salinity observations had been made at spring and at neap tides? A few have been made, and I have so far detected no increase of salt at spring tides. I also made some tidal rise observations at spring and neap tides. I had holes dug close to the dunes, and into these I put measuring sticks, and at high tide during spring tides there did seem to be an actual rise in level of the water in the holes, although there was no rise in the salinity. Unfortunately, if the winds do not happen to be north-west at spring tides, the tidal effect is neutralized, so that a considerable length of time is required to get trustworthy observations. The observations are too few, at present, to say anything definite.

Prof. Myres asked why the salt ceases so abruptly near the dunes close to Waxham, why there is so slight an inshore dilution on the landward side of Waxham holme, and, also, what the subsoil of the holmes was. Well, the level of the marshes is, comparatively speaking, high near Waxham, so that instead of salt marsh there is fresh marsh. About the subsoil of the holmes I know very little generally. On a small holme south-east of Horsey the plough turns up sand, and on the beach close to Winterton Ness an impermeable clay bed is slightly exposed at low water, but what the position of this clay bed is further inland under the holmes I do not know. Several analyses of the well waters on the holmes have been made, and in one or two cases the chloride content was fairly high, about 45 or 50 parts of chloride in 100,000 parts of water. Of course, even though the well-bottom on a holme reaches low-tide level, a great deal of chloride is not to be expected, since the salt water has been found to dip wherever the level of the land is, comparatively speaking, high. Forty-five to 50 parts of chloride is however, comparatively speaking, high, and it may possibly be that this amount of chloride is due to the fact that Horsey holme is only about 9′ above O.D. Waxham holme averages about the same height as Horsey. It may possibly be that this fact accounts both for the small dilution of the salt water on the marshes close to these holmes, and also for the comparatively high proportion of chloride in the Horsey well water analysed. Prof. Myres, I think, also wanted to know whether the salt-water layer in Holland has influenced the vegetation there. I do not think that the salt-water layer in Holland has in any way influenced the vegetation in the dunes area, but then the salt-water layer is not near the surface in the dunes area. Behind the dunes, in the Polder region, some of the dykes contain salt water, I believe, and where that is the case a salt aquatic vegetation is to be expected; but the Polders themselves do not, at any rate generally, carry a salt vegetation. I do not think that the salt-water table on the Norfolk coast is likely to influence agricultural conditions. For one thing, the valleys are, even where there is no question of the presence of salt water, most suited to pasture.

With regard to the algæ, which Dr. Darbishire asked about, very little work has been done. It is certainly one of the sides of the ecological work which does require taking up most urgently.

Mr. Gurney: With regard to the question concerning algæ, I am glad to take the opportunity of appealing to any one with a knowledge of the group to

come and study them at the Sutton Broad Laboratory. Their distribution in the district should be a subject of extreme interest, but it is a specialist's subject, and we at the laboratory are not able to take it up.

REVIEWS.

EUROPE.

A French River Study.

'La Loire—Etude de Fleuve. Ouvrage contenant 4 cartes et 42 graphiques.' By L. Gallouédec. Paris: Librairie Hachette et Cie. 7.50 *francs*.

This volume embodies a considerable amount of specialized knowledge of river development in general, and of the Loire in particular, which would be welcome in an English translation.

Monsieur Gallouédec lays special emphasis on the part played by the underlying geological formations in determining the character of the river throughout its course. He goes on to discuss in much detail the effect of relief and of climate upon variations in volume at different seasons, not only in the main stream, but in each individual tributary. An interesting comparison is drawn between the basins of the Seine and the Loire, 45 per cent. of the latter being underlain by impermeable rocks whilst the proportion underlying the Seine basin is only 25 per cent. Thus it follows that whilst equability is the most striking characteristic of the Seine, the Loire has earned for itself the character of being unreliable in volume, and therefore unsuitable as a great artery of commerce.

Other circumstances, however, contribute to this condition of things, and not least the fact that the upper Loire and Allier draw from the central massif large quantities of water which are apt to descend in torrents to the main stream by reason of the rapid fall of these rivers. Sometimes, too, the precipitation of several weeks is held up not only in the central massif, but also in the less elevated portions of the basin, in the form of snow and ice, and then suddenly much of this is thrust on the already swollen river, with inevitable floods as a result.

Monsieur Gallouédec emphasises the fact that the Loire is least often in flood when precipitation is at its highest, that is in the summer months when the volume of water is reduced not only by general evaporation, but by the enormous transpiration incident to plant life. He does not appear to dwell with equal insistence on the fact that in winter, the general frozen condition of the ground some feet below the surface renders large tracts of ground temporarily impermeable, even though at the surface a thaw may have set in. Thus in the winter months a far larger proportion than 45 per cent. of the whole basin may be underlain by impermeable rocks.

The Middle Loire is lowest in July, August, and September, when it is not unusual to find the once powerful stream reduced to a series of discontinuous pools separated by strands of transported material, which for the time being are at rest. The part of the river subject to the most striking fluctuations is some distance above Orleans, where the navigability of the river is of an unusually precarious character. The cause of this is not difficult to find, for at a point 41 kilometres above Orleans the river emerges from a zone of fissured limestone, where the loss of water by percolation is sufficient in summer to destroy its continuity of flow.

The book exemplifies the value of graphic illustration, and is in every way

a welcome addition to the now considerable literature on river development. It would have added greatly to the usefulness of the volume had it been illustrated by larger geological and orographical maps.

E. S.

'The Isles of Scilly.' By Jessie Mothersole. (London: Religious Tract Society. 1910. Pp. xii., 244. *Maps and Illustrations.* 10*s.* 6*d.*) The writer of this book is also the artist, and her pictures are its chief and a very charming feature. It is probably due less to her method than to the process of reproduction if, in some instances, the extremely vivid colouring seems dubious, even for Scilly. As for the text, she claims for it only such scope and character "as is necessary to comply with the unwritten law of colour-books." As a fact, it is of much greater scope and value than the very thin string of text on which pictures in books are too often hung; it displays no mean study of the history and people of the islands, a good appreciation of their scenery and some understanding of their physical character.

'Unfrequented France.' By M. Betham-Edwards. (London: Chapman & Hall. 1910. Pp. x., 204. *Illustrations.* 10*s.* 6*d.*) The motor-car and the Touring Club de France are bringing the interests of that country increasingly to the knowledge of English travellers, and this book will be found to point out many beautiful towns and districts which they should not miss. The first part, from Paris to Besançon and Lyons, includes the Jura; the second deals with the Rhône, the Tarn and the Causses, and the third with districts lying roughly between Clermont-Ferrand and Nantes. It is not to be supposed that many possess so intimate a knowledge of the country as to be able to use such instructive means of travel as the calèche or the barge, as Miss Betham-Edwards often did.

'Catalonia and the Balearic Isles.' By A. F. Calvert. (London: Lane. 1910. Pp. xv., 107, 256. *Illustrations.* 3*s.* 6*d.*) This volume of the Spanish series is as good as its predecessors. The numerous photographs, which fill the last 256 pages, are of more general interest than those in some of the other volumes, being (as the nature of the subjects demands) less nearly confined to architectural and other artistic detail. From the geographical standpoint, perhaps the most remarkable are the studies of the wonderful site and surroundings of Montserrat, of which there are no less than nineteen. The text is readable, and as far as it goes, informative.

'Mentone and its Neighbourhood.' By G. Müller; ed. by Rev. J. E. Somerville. (London: Hodder and Stoughton. 1910. Pp. xvi., 464. *Maps and Illustrations.* 12*s.*) An original writer who lived near Mentone for some thirty years, and an editor who is well qualified for his task by first-hand knowledge, have produced an almost monumental work on this district. The editor fears lest he has not been sufficiently severe upon the discursive style of the original writer, and not without reason; but the information in the volume, especially on antiquarian and historical topics, is vast and erudite, and much of it must hardly be accessible elsewhere.

'Unexplored Spain.' By Abel Chapman and W. J. Buck. (London: Arnold. 1910. Pp. xvi., 416. *Illustrations.* 21*s.*) As in their well-known and popular volume, 'Wild Spain,' these writers deal principally with the fauna, and especially with the bird-life, of certain little-known parts of Spain. Great part of the volume consists of sporting records; but they handle and illustrate their subjects scientifically as well, and at the same time provide effective word-pictures of the districts they have visited.

ASIA.

The Himalayas.

(*a*) 'Twenty Years in the Himalaya.' By Major the Hon. C. G. Bruce. London: Arnold. 1910. 16*s. net.*

It is no new experience that when a man of action takes a pen in his hand he beats the professional writer at his own game. Certain it is that few practised authors could have written such a book as this. It is so alive, so cheery, and gives the impression of so much knowledge and experience in reserve. In fact, however good a book this may be, regarded as an account of a region of the earth, it is still better as giving an unintended but most attractive picture of the singular and rich personality of the author. The man behind the book is the thing, rather than the mountains behind it. A robust human being hurries through the pages laughing, boistering, observing, and obviously always leading others.

If it be true, as it is, that no man knows the mountain region of the Himalaya over so large an area as Major Bruce, it is likewise true that no one begins to know the various mountain peoples of many races, languages, and kinds as he does. They open themselves to him as a nut to a nut-cracker. From a Gurkha to a Balti he finds them no impossible riddle, obviously because he begins by liking them in a plain human rather than in a scientific fashion. It almost follows that such of them as find place, live on his pages. Without effort on his part he makes them credible and vital, seeing them no otherwise himself.

Major Bruce writes apologetically, or rather deprecatingly, of his own powers as a climber. He had no chance to learn in the Alps under established experts, and the gigantic Himalayas are a poor training ground. However this may be from the modern highly trained expert rock-climbing point-of-view, the fact is that he climbs as well as a man need for the purpose of getting anywhere in ordinary reason, and that, after all, is the sole purpose of climbing. The best men, such as Mummery, Collie, and Longstaff, were glad enough to have him on their rope when they could get the chance.

The volume opens with a charming sketch of Nepal as seen by one who knew what to look for. No account of that district possesses anything like the quality of these thirty pages. Any one who knows mountain country can at least understand this description, far vivider than photographs; but a man must have lived twenty years with Gurkhas to be able to see so much that is fresh on a highway so frequently trodden.

Sikkim comes in for less lively treatment, but that was the weather's fault; besides, has not the story been told by Freshfield? We are next whisked off to Kumaon and Garhwal, this time with Longstaff and Mumm. In Kumaon, we are told, "everything runs to waste, especially grass.... There is no industry and no forethought. This seems to be the character of the Garhwali peasant. But . . . a pleasure to meet. . . . Simple, pleasant mountain folk, strong and enduring," and so forth, followed by a page or two of excellent characterization and incident.

Dharmsala and Chamba, Suru, and then Kaghan, are the headings of chapters, each of which might have been a book. Kaghan is Major Bruce's particular scrambling ground. It is near his Indian home, as nearness goes in those parts. The mountains are of reasonable size. The whole country was practically unknown when he first took it up. It proved to be an excellent training ground for his Gurkha companions. A delightful country to have near at hand, but not big enough in scale to become famous.

Then we pass on to Gilgit and Baltistan and the great Karakorams, and to

Nanga Parbat and Chilas, where war and mere sport find place, and brave deeds done as lightly in the one as in the other. And so away westward still, to Chitral and the great Tirich Mir in the Hindu Kush, beyond which no one yet has had aught to say about mountains.

The volume concludes with an admirable description of camp life in the hills from a lady's point of view, by Mrs. Bruce, with much that is delightful about the flowers, of camping in "a sea of blue forget-me-not and giant larkspurs," and other such lovely sights as may well arouse the envy of an untravelled reader.

In brief, the book is one to be read, and that will outlast many an explorer's carefully compiled tale. It will live because its pages are full of life.

M. C.

(*b*) 'The Call of the Snowy Hispar: A Narrative of Exploration and Mountaineering on the Northern Frontier of India.' By William Hunter Workman and Fanny Bullock Workman. London: Constable & Co. 1910. 21*s. net.*

Few persons, if any, have made more adventurous expeditions into the north-western part of the Himalaya than Dr. and Mrs. Workman; the results obtained, specially in the detail of main glaciers and their feeders, have been of much use in filling in blanks or correcting somewhat imaginative sketches, made in 1855–64, when Kashmir was surveyed by a party under Captain T. G. Montgomerie, R.E., of the Great Trigonometrical Survey of India. His work, so far as it went, being chiefly triangulation and investigation of routes, was admirable; but the supply of fuller particulars was beyond his scope. Consequently geographers and travellers are deeply indebted to those who fill in blank spaces on the map, and add to its topographical detail.

The immediately previous exploration by the authors of the book under consideration was around the peaks and glaciers of Nunkun, two great mountains (Ser and Mer), almost due east from Srinagar, which tower a clear 3000 feet above their neighbours; this time they went a long way further north, passing beyond the old boundary of the Kashmir State. The route lay from Srinagar to Gilgit, and thence up the Kanjut valley to Hunza and Nagar, where the Mir was called upon and asked for assistance in coolies and supplies. The party was a considerable one consisting of two Italian scientific surveyors, the guide Cyprien Savoye, three European porters, and coolies as required, Mr. Hogg being in charge of the camp. They arrived at Hispar, a village near the foot of the glacier, early in July, 1908, and thence dividing into parties traversed the length of the main glacier, and investigated some of the side ones. The map from the original drawing of Dr. M. Koncza is beautifully clear, and is a useful contribution to our imperfect knowledge of those regions. Return was made by the Hispar pass, and the Biafo glaciers to Askole and the Braldu river, across which on a ropebridge one of the party had to be carried blindfolded, as he could not endure the sight of the raging stream beneath. The Shigar river was followed to Skardo where it joins the Indus, and thence the party crossed the Deosai plains to Gurais and Srinagar.

The book is pleasantly written and full of interest to mountaineers; the illustrations are excellent and well selected, some, such as that at p. 224, of Lakelets at upper Hispar, are singularly instructive, and of a quality to match those in Dr. Sven Hedin's "Scientific Results," of his journeys in and about the Takla Makan, than which no higher praise can be given.

W. Broadfoot.

Persia.

'Overland to India.' By Sven Hedin. 2 vols. London: Macmillan. 1910. 30*s. net.*

The true traveller in Persia, so the saying runs, will return there thrice: and thus it was merely a matter of time for Dr. Sven Hedin, who had already visited and travelled widely in historical Iran in 1885 and again in 1890, to fulfil his manifest destiny by making a third and still longer journey through the heart of Persia.

The geographical and indeed the general interest of the book centres mainly round the palsying desert which withers the heart of Persia, and which Dr. Sven Hedin traversed throughout its utmost extent, from Veramin, a few miles from the capital on the north-west, to Sistan on the south-east confines of Persia; and, as if this was not enough, the still more dreary trade route, on which there are no oases, was followed to Nushki and Quetta. Taken in conjunction with his other explorations, there can be no living traveller with such an experience of deserts, and this experience is invaluable by affording constant points for comparison.

Dr. Hedin treats the blighting salt swamps or Kavir with his usual thoroughness, crossing and recrossing the Great Kavir, which is only safe in dry weather, and may, in a few hours, become an engulfing morass. Here the traveller had just enough experience of its unpleasant side to show that the stories of the caravan owners, as to the frequent loss of their camels and occasional loss of human life, were well founded. Perhaps his most interesting remark on this subject is that "the physical geographical changes now in progress, will end in converting the Kavir into a sandy desert."

A point of some interest is the nomenclature of this immense desert. Dr. Hedin holds that it is termed Kavir in the north, and that the word Lut is not heard of until Tabas be reached. This is true: but yet many well-educated Persians have laid it down that it is correct to state that the Lut stretches from Tehran to Sistan and that it includes the Great Kavir: in short, the greater includes the less. However, the term Lut is mainly used by southern Persians, and as the term is comparatively a modern one, it would be possible to find other educated Persians who declined to employ it in a general sense.

Another question raised is whether Marco Polo visited Tabas, and Dr. Hedin, after his visit there, decides in the affirmative. The reviewer, as pointed out by the author, originally agreed with this opinion: but after visiting Tabas took an opposite view. Here, again, it is impossible to dogmatize, and one can only regret that Sir Henry Yule is not still alive to form a court of appeal on this interesting question.

Alexander's march is the title of another chapter, which has apparently been written, partly, at any rate, to show that, in the author's opinion, the climate of Persia has not changed perceptibly during the last two thousand years, whereas the contrary is also maintained. There is no doubt that, as Dr. Sven Hedin states, there was a terrible mortality among the Greek veterans and camp followers, mainly owing to lack of water in that part of Baluchistan which lies between Karachi and Pahra; but this latter centre supported the whole force for two months, and thenceforward there is no further mention of scarcity. The reviewer was the first European to follow in the footsteps of Alexander in his next section of some 200 miles to the district of Rudbar, and this journey would have been impossible but that supplies were stored at every stage. Not a village, not a hamlet was to be found in all this huge stretch of country, which surely must have changed considerably, from the point of view of climate, since

it was traversed by the mighty "Lord of the Two Horns," as Alexander is known to the East. Here, again, however, man may have destroyed a population which has not been replaced, and no doubt this factor has to be considered; but, upon the whole, the fullest examination of the facts tends to show a decreased rainfall, as Mr. Ellsworth Huntington points out.

However, these and many other questions have all been treated in so courteous a manner by Dr. Hedin that the advantage of having the case stated so ably and with such knowledge will be of considerable benefit to future students of these important questions. The book has been got up in the style we are accustomed to connect with Messrs. Macmillan. If a criticism be made, it is that there is a certain sameness in some of the illustrations of strings of camels; on the other hand, the illustrations of Tabas and Naiband are delightful, and so are the sketches of types of villagers of all ages and of both sexes, which we owe to the skilful pencil of the indefatigable explorer. P. M. S.

Northern China.

'Lion and Dragon in Northern China.' By R. F. Johnston. London: Murray. 1910. 15*s.* net.

The author in his capacity of district officer and magistrate at Wei-hai-wei has naturally accumulated a considerable store of detailed information regarding Northern China generally, in addition to the facts amassed during his journey "From Peking to Mandalay." Wei-hai-wei, he goes on to tell us, is in many respects a true miniature of China, and a careful study of nature, life, and character as exhibited in this comparatively small district, may, he thinks, supply a clearer and truer insight into the life and character of the Chinese race than might be gained from any superficial survey of China as a whole. Inquirers into the sociological and other conditions of rural China will thus find much to reward them throughout Mr. Johnston's four hundred and odd pages. The climate of Wei-hai-wei is good, the rainfall being about the same as in England, though the winters are a good deal colder. Considerable interest will attach to the author's remarks about the disbandment of the Chinese regiment, for he naturally knows all the pros and cons of that vexed question. The soldiers did excellent service against the Boxers, and proved—if indeed proof were needed after the well-known achievements of General Gordon—that Chinese, properly treated and well trained and led can make first-rate soldiers. Mr. Johnston remarks truly enough that with the disbandment of the regiment disappeared Wei-hai-wei's only garrison. The place is thus entirely destitute of troops and of fortifications, and during the long winter months—when there is not so much as a torpedo-boat in the harbour—it is practically at the mercy of any band of robbers that might happen to regard it with a covetous eye. Nevertheless the author—in conflict it may be observed with most Englishmen in China—thinks the abolition of the regiment a wise step, principally, as it would appear, on financial grounds, for its maintenance cost the British tax-payer £30,000 per annum. On the other hand the author would probably concede that British interests in China amount to many millions, and that, if it were viewed only as a mobile police force, the regiment might prove simply invaluable in the event of one of those local uprisings and insurrections by which Europeans in China are not infrequently menaced.

The manners and customs, religion, every day occupations, chronicles, legends, village life, land tenure, and litigation, occupy about a dozen chapters. All this information is the fruit of close observation and skilfully put together. The anecdotes and characteristic stories of Chinese life are far too numerous to be quoted, but whether for general readers, or for students of the celestial empire

and its people, there is no doubt that Mr. Johnston's volume will be found of singular and sustained interest.

'The Land and the Book.' By W. M. Thomson, D.D. (London: Nelson. 1910. Pp. xvi., 727. *Map and Illustrations.* 6*s.*) This edition of a well-known work, revised by Mr. Julian Grande, is well produced at the price, though exception must be taken to its monstrous weight. It is excellent reading in its way, and full of instruction, the work of a brilliant scholar and a most observant traveller, inspired with deep affection for the Holy Land.

'Behind the Scenes in Peking.' By Mary Hooker. (London: Murray. 1910. Pp. viii., 209. *Plan and Illustrations.* 7*s.* 6*d.*) In this volume an American lady, who went through the siege of the Legations in 1900, writes of what she saw and those whom she knew, without fear or favour. Her sources are letters and a diary written at the time, and the narrative is plain and never becomes unbalanced by the dreadful circumstances.

AFRICA.

Mr. Roosevelt's East African Expedition.

'African Game Trails. An Account of the African Wanderings of an American Hunter-Naturalist.' By Theodore Roosevelt. *Illustrations.* London: John Murray, 1910. 18*s. net.*

Mr. Roosevelt's account of his expedition in East Africa makes its appeal primarily to the field naturalist. His "pages from the book of nature" exhibit abundantly that keen love of the wilds, and of its denizens, which is a leading characteristic of the author. Nor is it game trails alone that attract him; observant of all his surroundings he notes the customs and cultures of the tribes through whose lands he passes, describes vividly the highlands and the forests, the sandy wastes and the river and lake country in which they dwell, and, notably, he never misses nor fails to appreciate every effort being made by white pioneers to subdue and replenish the Earth. His route (which is shown on a small sketch map) was through British East Africa, the Uganda Protectorate and the Nile country, to Khartum, and his book aids geographical knowledge both by particulars of zoological distribution and by the clear and accurate manner in which it pictures the regions named.

The author's style not infrequently partakes the luxuriant character of tropical vegetation. Thus a lion becomes "the maned master of the wilderness, the terror that stalked by night, the grim lord of slaughter," but though his language be flamboyant Mr. Roosevelt achieves his purpose of arresting attention; the description quoted is from a very spirited account of a lion hunt by Nandi warriors armed with spear and shield. As to the achievements of European nations in Africa—especially Great Britain—Mr. Roosevelt finds little cause for blame and much for praise. It is notable that he not only praises the work of the Protestant and Romanist missionaries, but found the mission boys of his safari excellent fellows.

A point of importance discussed in the text and in an appendix is that of "protective coloration" in animals—on which subject Mr. Roosevelt holds heretical (though, we are inclined to believe, true) views. Another interesting appendix is concerned with the books which Mr. Roosevelt read when on safari; a third is devoted to a biological survey of Mount Kenya, a fourth gives the text of the speeches Mr. Roosevelt made at Cairo and at the Guildhall.

The fact that the narrative was written hot from the scent may account for one or two slips (and there are not many), such as *King* Henry the navigator,

but was it ignorance or indifference that led Mr. Roosevelt to write *Lake* Victoria Nyanza, *Lake* Albert Nyanza, etc. ? The illustrations are numerous and excellent ; some of them are extraordinary, as that of the hyena within the belly of an elephant.

F. R. C.

The Congo Country and People.

'A Voice from the Congo. Comprising Stories, Anecdotes, and Descriptive Notes.' By Herbert Ward. London : William Heineman. 1910. 10*s. net.*

Mr. Herbert Ward's volume deals with the Congo basin in its physical aspects, and chiefly with the peoples of that region. Impressionist in style, it contains hardly any precise information such as one gets in a geographical treatise. (Almost the only attempt at systematic information will be found in the chapter headed "Congo Characterstics," which extends to but ten pages). Though this be so, the book has the great merit of producing clear mental pictures both of the nature of the country and of the character of its inhabitants. The great river, the dense forests, the life led by the Congo tribes—their loves, their wars, their industries, their religion—all these things are clearly portrayed. Mr. Ward rightly insists upon the immense influence which the nature of their land has exercised upon the mentality of the tribes of the forest regions. He inclines to think the Congo peoples degenerates, rather than primitives slowly struggling to a higher plane. His descriptions of the various tribes have the advantage of being based upon observations made from twenty to twenty-five years ago, when the majority of the Congo natives had been little influenced by contact either with Europeans or Arabs. Mr. Ward's account, not now applicable in all points to the peoples in question, has therefore distinct historical value. His information about cannibalism is both full and precise. It includes some gruesome details. Against this may be set many pleasing pictures of village scenes. The book contains illustrations from photographs, sculpture, and drawings by the author, and these illustrations are of great merit. This is specially true of the reproductions of sculpture. Mr. Ward's bronzes, which are instinct with life, present characteristic types, such as a warrior, a sorcerer, a mother and children, etc.

The historical matter in this book deals with the founding of the Congo State with Stanley's quest of Emin, and with Tippoo Tib and other Arab slave raiders. Present-day problems are touched upon very lightly.

F. R. C.

The Anglo-Egyptian Sudan.

'Service and Sport in the Sudan.' By D. C. E. ff. Comyn. London : John Lane, 1911 [1910]. 12*s.* 6*d. net.*

The sub-title of this book, "a record of administration in the Anglo-Egyptian Sudan, with some intervals of sport and travel," accurately describes its character. The author, late of the Black Watch, first served in command of an Arab camel corps in Kordofan, and later in the civil administration, largely in the Bahr-el-Ghazal mudiria. He has two pieces of exploration to his credit, one of part of the Pibor river (1904), the other of desert routes west of Wadi Halfa (1906). Accounts of both these undertakings have appeared in the *Journal* (see vol. 31), and the maps given in this book are those published by the Society. In the desert west of the Nile he passed a prehistoric ruin. A scientific examination of the Arbain road would probably well reward the archæologist. Major Comyn also contributes his quota to the vexed question of the northern tributaries of the Bahr-el-Ghazal. He thinks that the Wadi Shalango of southern Kordofan

joins an affluent of the Ghazal which flows east of the main northern tributary of that river. A Government expedition visited the Nuba highlands in the closing months of 1910, and it is to be hoped that it has had an opportunity of helping to make clear the puzzling hydrography of the region.

Exploration apart, the author conveys with considerable success a picture of the aspect of the districts in which he worked, and his descriptions are aided by some excellent photographs. He disclaims ethnological knowledge; nevertheless he gives us a lively account of the tribes with which he had to deal as well as of the multitudinous tasks which fall to the lot of a political officer on the outskirts of empire. His book should likewise prove a good guide to the big game hunter. The author had the fortune to meet Count Teleki (who was on a shooting expedition), but he would have done well to refrain from reproducing that explorer's statement concerning Sir H. M. Stanley.

F. R. C.

'Nigerian Studies.' By R. E. Dennett. (London: Macmillan. 1910. Pp. xv., 235. *Map and Illustrations.* 8*s.* 6*d.*) This study of the religious and political system of the Yoruba is by an authority already recognized through previous work. It must be confessed that (as the writer appears from his preface to realize) the work is far from easy of comprehension by the uninitiated; it may even be questioned whether some of the investigations here set forth commend themselves to publication. However, the book is bound to be of value for those whose work brings them into contact with these native peoples, as few can have had the opportunity for such close study as the writer has been able to give them.

'Storm and Sunshine in South Africa.' By Rosamund Southey; ed. by Frances Slaughter. (London: Murray. 1910. Pp. ix., 378. *Illustrations.* 12*s.*) This is a narrative, pleasantly written and eminently readable, by one who has had a wide experience of South African life and close relationship with administrators and other workers in that country. A waggon-journey through Zululand, visits to many towns and to farms, experiences during the war-time, make up a collection of interesting incidents.

AMERICA.

'Highways and Byways of the Rocky Mountains.' By Clifton Johnson. (New York: Macmillan Co. 1910. Pp. xi., 279. *Illustrations.* 8*s.* 6*d.*) This volume deals with the Rockies of the United States. It is compiled on rather unusual lines, consisting in great part of verbatim narratives of their experiences given to the author by natives or settlers in the various districts visited by him. The result is an entertaining book not containing much valuable information. There are good photographs, however, and a few notes on the best routes and seasons for travel.

'The Old North Trail.' By W. McClintock. (London: Macmillan. 1910. Pp. xxvi., 539. *Illustrations.* 15*s.*) The writer has had exceptional opportunity for studying the "folk-lore, religious beliefs, and ceremonials" of the Blackfeet Indians, and realizing the possibility that the recollection of these will probably pass away from among the Indians themselves at no distant period, he has put his knowledge into book form. The volume includes not only records of folk-tales told to him, but descriptions of ceremonies he has witnessed and a narrative of his experiences during life among these interesting people.

POLAR REGIONS.

The Danish Greenland Expedition, 1906–8.

'Im Grönlandeis mit Mylius-Erichsen. Die Danmark-Expedition, 1906–1908.' Von Achton Friis. Autorisierte Uebersetzung von Friedrich Stichert. Leipzig: Verlag von Otto Spamer. 1910. Pp. 630. *Price* 15*m*.

As is known to readers of this *Journal*, the Danish expedition under Mylius-Erichsen completed the survey of the coasts of Greenland by uniting the work of the Koldewey expedition to the furthest point which Peary had reached from the north, or from 76° 50′ to 82° 58′ N. lat. The vessel, the *Danmark*, was after some difficulty with the ice brought to an anchor in Danmarkshavn, near the south-east extremity of Germania land, and thence in the autumn of 1906 short sledge excursions were made to the great Koldewey island (which proved to be one divided by two deep breaches and not three as on Koldewey's map), and to the neighbouring coasts, and depôts of provisions were made northwards for the great sledge expeditions of the following year. Of these the most successful was led by Captain Koch, the cartographer of the expedition, who reached Peary's cairn on the coast of Peary land, and extended his journey to Cape Bridgeman in the hope of completing the survey of the coast of Peary land where the American discoverer had met with foggy weather. Similar weather prevented Dr. Koch also from performing this work thoroughly.

Mylius-Erichsen, accompanied by Lieut. Höegh-Hagen, cartographer, and Brönlund, a Greenlander, was not so fortunate. Delayed by hummocky ice round the great western peninsula of Greenland, and mistaking a land on the west side of Danmark fiord and south of Independence bay (Mylius-Erichsen land) for Peary land, they met Dr. Koch on his way southwards. They then marched westwards into Independence bay, and a southern inlet now called Hagen fiord. On their return they had difficulty in obtaining food and lost all their dogs, and worn out by their exertions and the cold, Erichsen and Hagen perished near the glacier north of Lambert land, while Brönlund reached a depôt on Lambert land where he also died, and his body was found by Captain Koch, and a diary in which the fate of his companions was recorded.

Though much affected by the loss of their leader, the members of the expedition prosecuted their scientific work energetically, and a sketch of their acquisitions in various branches of science has been contributed by Dr. Lindhard, the doctor of the expedition to this *Journal* (May, 1910). On the death of the leader it was decided that Mr. Achton Friis should write the narrative of the expedition and with the help of the diaries of the leaders of the exploring parties he has been able to give a very complete account of the geographical results. The volume is well illustrated by the author and Mr. Bertelsen, the other artist of the expedition, and with photographs, but the map is defective; many names of importance in the narrative are not marked on it.

The Second Charcot Expedition.

'Le Pourquoi Pas? dans l'antarctique 1908–1910. Par le Dr. Jean Charcot. Paris: E. Flammarion, 1910. 15 *fr*.

To the chief discoveries of Dr. Charcot's recent expedition we have already called attention in reviewing a preliminary pamphlet on its results (*Journal*, November, 1910, p. 606). That summary of his results is reprinted as an appendix to this general narrative of the expedition, but an addition is made in the shape of several maps. While some of these are good, notably those of the winter quarters at Petermann island and the opposite coast of Graham

land, the general map of the regions visited is disappointing, but we understand it is a provisional chart and not the final map of the expedition. The land which Dr. Charcot discovered in the *Français* in 1905, and named Terre Loubet, he since found to be in reality Adelaide island, so he has transferred the name of Loubet to the mainland east of the island. Loubet land continues southward in the new Fallières land, but this second name does not seem to be very necessary. The new land which the Pourquoi Pas ? discovered in about 70° S. has been named Charcot land, after the father of the leader of the expedition. It is most unfortunate that this coast was unapproachable through heavy pack. Dr. Charcot says that "some high summits seemed to loom up in the distance passing behind Alexander island in the direction of Fallières land," but meanwhile he rightly declines to place them on the chart. However, there seems little doubt that Graham land—to use the name that, rightly or wrongly, is applicable to all this peninsula—is continuous towards Edward VII. land and Victoria land; nor is it improbable that Charcot land will prove to be an island of greater or less extent and of a structure comparable to that of Adelaide island or Alexander island.

Dr. Charcot very rightly insists on the importance of Dallmann's discoveries in 1874, and the injustice of overlooking his names of Booth, Krogmann, and Petermann islands, which were quite erroneously rebaptized by the *Belgica*, Wandel, Hovgaard, and Lund. Occasionally, however, the author makes a slip himself and writes of Wandel island. But on the vexed question of nomenclature Dr. Charcot on the whole sets an example that many explorers might do well to follow, and we are glad also to notice his desire to perpetuate the names of explorers who have previously been associated with this part of Antarctic regions. One or two other cartographical points might be noted. Smiley island that is occasionally found on charts to the south-west of Alexander land must go; while in the South Shetlands, the same fate is the lot of Middle island which Nordenskjold failed to find, not to speak of Bellingshausen and d'Urville, but which, nevertheless, has long figured on Admiralty charts.

We trust that Dr. Charcot will be enabled to find the funds necessary to publish in a worthy manner the results of this well-organized and successful expedition.

With Dr. Charcot's graceful and lucid style of writing, readers of polar literature are familiar from his earlier book on the voyage of the *Français*. The present volume is no less interesting and no less graphic, and must rank among the best written polar travels. Dr. Charcot has ably avoided that pitfall into which too many polar explorers fall—monotonous detail and a wearisome reiteration of trivialities. The illustrations are excellent and numerous, but the lack of an index is a marked blemish in an excellent volume.

R. N. R. B.

'The Great White North.' By Helen S. Wright. (New York: Macmillan Co. 1910. Pp. xviii., 489. *Maps and Illustrations.*) This exceedingly commonplace title conceals a useful work of reference to north polar exploration from the earliest time to the present day. A work of reference it may be called advisedly, for it enters too far into detail to make it readable as a whole without being tedious, as the continuous narrative of the similar experiences and adventures which have befallen most Arctic voyagers must be. It contains a bad map, whose constructor was unacquainted with Mylius Erichsen's results in north-east Greenland; the illustrations of scenery are sufficiently awe-inspiring. There is an adequate index.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Surveying.

'A Text-Book of Theodolite Surveying and Levelling, for the use of Students in Land and Mine Surveying.' By James Park, Professor of Mining Engineering, etc. *With ninety-one Illustrations and Plates.* London: C. Griffin & Co., Ltd. 1908.

This text-book gives a considerable amount of information on surveying which should be useful to civil and mining engineers, for whom it is specially intended. It deals with survey work in all its branches, including astronomical observations, although this and some other sections are in parts perhaps too condensed to be of as much practical value as might be desired. In certain instances improvements might be suggested, as in the case of the transit theodolite described and shown in the figure, which is of a form that is quite unsuitable for the accurate measurement of vertical angles, such as are required for astronomical observations, owing to the fact that the level is on the telescope instead of on the vernier arm, thus rendering it impossible to read level divisions when the telescope is reversed, and to apply the necessary correction. There are one or two other points that might be noticed, but, on the whole, the book is a good one, and will no doubt be found serviceable to many.

GENERAL.

'The Broad Stone of Empire.' By Sir Charles Bruce. (London: Macmillan. 1910. Two vols., pp. xxxiv., 511; viii., 555. *Maps.* 30*s.*) The sub-title, 'Problems of Crown Colony Administration,' indicates the scope of this important work. The author, whose principal official connection has been with Mauritius, discusses national and colonial policy in introductory chapters, and writes, of course, with first-hand knowledge on local government, law, racial and labour questions, health, education, and other important branches of administration. The book is well indexed and admirably easy of reference; the maps are adequate, but as regards those of the individual colonies, of inordinately large scale for the amount of information they contain.

'The Prevention of Malaria.' By Dr. Ronald Ross. (London: Murray. 1910. Pp. xx., 669. *Illustrations.* 21*s.*) Dr. Ross has the collaboration of a number of contributors of various nationalities in this important work on what is "perhaps the most important of human diseases." His collaborators deal at first hand with the prevalence and prevention of malaria in every part of the world where work has been carried on, and thus the book includes a valuable contribution to a knowledge of the geography of the disease.

THE MONTHLY RECORD.

EUROPE.

Time in France.—After full discussion and some opposition in the French Senate, the bill lately introduced for the universal adoption in France, for the purposes of everyday life, of a time 9 minutes 21 seconds behind that of Paris, was finally passed on February 10, an amendment having been previously rejected by 213 votes to 73. The time thus adopted is to all intents and purposes that of Greenwich, although some of the speakers in the discussion were careful to point out that it is not absolutely correct to speak of it as such. France thus at last comes into line with most of the nations of the world by concurring in the system of "hour zones" first introduced in the United States

some years ago, the time adopted being that of Western Europe generally. There can be no doubt of the practical utility of the step, though for scientific purposes the meridian of Paris is still adhered to. The alteration is too small to cause inconvenience of any kind, for already, since the adoption of a standard time for all France in 1891, the difference between this and local time has amounted to 27 minutes in the extreme west. The result of the change will be that the maximum difference (29 minutes) will now be in the extreme east.

Snow-measurements in the Swiss Alps.—An article by Julius Maurer in the *Meteorologische Zeitschrift* for July, 1910, entitled "Einige Ergebnisse aus Schneemessungen in den Schweizer Hochalpen und ihre Beziehungen zu den Schwankungen der Firnlinie," handles some of the questions connected with snow-measurement in a highly interesting manner. Experiments on the Gotthard-Hospiz pass showed that unprotected gauges (Ombrometer) caught 20 per cent. less snow or rain than those furnished with a Nipler wind-protector to eliminate the effect of eddies round them. Results of observations figure for the Säntisgipfel (2500 metres), the Eigergletscher (2330 metres), the Gotthard-Hospiz (2100 metres), the Bernina-Hospiz (2330 metres), the Ornygletscher, the Titlisgipfel (3239 metres), and other places. On the Säntis, the yearly precipitation (1888 to 1907) amounts to 2448 mm. (96·4 ins.), of which 72 per cent. falls as snow, the percentages for the twelve months being respectively 100, 99, 99, 99, 84, 47, 34, 33, 54, 81, 98, 100. The summit becomes free of snow after mid-July, when the mean air-temperature exceeds 6° C. (42·8° Fahr.), and becomes covered again towards the middle of September, when it has dropped to 3° C. (37·4° Fahr.). The melting of snow is rapid at the end of May and beginning of June, but afterwards is markedly checked despite the rising temperature, owing to the fact that the process of melting reaches successively deeper and consequently denser layers of snow. The author himself has for several years made telescopic observations of the Firn level on the Titlis, and the results show that during the last decade the Firn cover has been levelled down by as much as 10 metres, and that in consequence of the excess of the removal of snow over its replenishing in this central region of the high Alps, the Firn-line has shifted considerably, a fact which is illustrated in the article by photographs. It is curious here to note that the peculiar consistency of old snow—half-formed glacier ice—is called Firn by the Germans (Ger. *firn*, old) and *névé* by the French (It. *neve*, snow); and it is illustrative in a small way of the effect of geographic environment on the development of language that the German and French languages, which both appropriated different parts of the domain of the high Swiss mountains, had to evolve a word for a phenomenon for which there is no true English equivalent, even of the most recent growth.

Temperature Seiche in the Madu-See, Pomerania.—A joint survey of this lake has lately been made by Mr. E. M. Wedderburn (one of Sir J. Murray's coadjutors on the survey of the Scottish lochs) and Prof. Halbfass, with several assistants. The chief object was to ascertain whether the existence of a temperature seiche, such as has been demonstrated in Scotland, could be established for a German lake, Prof. Halbfass having doubted whether, apart from exceptional cases, the conditions in Germany were favourable to the production of such a seiche. The Madu-See is one of the largest, though not the deepest, lakes of northern Germany. The shores are low, and the wind is therefore not forced to blow along the lake, as in the case of one bounded by high hills. The configuration of its floor is also somewhat unfavourable to the production of a regular seiche. The results of the observations, which are briefly outlined by Mr. Wedderburn in the December number (1910) of the

Scottish Geographical Magazine, show, however, that a well-marked temperature seiche may at times occur. Observations were made without intermission every two (sometimes three) hours at Moritzfelde, at the northern end, from August 8 to August 14, and from the 8th to the 12th at Werben, in the south. From these Mr. Wedderburn has plotted curves showing the depth at which the temperature of 12° C. (53·6° Fahr.) was found at the two stations (this isotherm being chosen as that about which the most rapid change occurred). They show a remarkably regular oscillation, with a period of very nearly twenty-four hours, and also disclose the fact that when the isotherm is falling at one end of the lake, it is in general rising at the other. Similar oscillations were observed at other times, but, owing to the greater intervals between the observations and the less regular character of the winds, were not so clearly marked.

ASIA.

The Trade and Condition of Arabistan.—The attention directed of late years to the province of Arabistan, in southern Persia, gives a special interest to the consular report for 1909–10, by Lieut. A. T. Wilson. The disturbed condition of Persia, combined with an unfavourable season for cereals in Arabistan, has not, as might have been anticipated, prejudiced the trade at Mohammerah, the disturbances on the Bushire-Shiraz road having led to increased trade *viâ* the Ahwaz-Isfahan road. Potentially, Arabistan is one of the richest provinces of Persia, and for five years at least it alone has been undisturbed; the public safety is well cared for, and European interests respected. Apart from the transit trade, however, commerce makes little progress, for the population is too scanty and apathetic to develop the great agricultural resources of the country, although thousands of acres could be irrigated on the Hindijan and Jarraki rivers and in the neighbourhood of Mohammerah. The Arabs of the desert pursue a nomadic life, subsisting on the produce of their flocks and on the wheat crops when the season is favourable—an event which occurs about thrice in ten years. But wherever irrigation is possible, and date groves and rice can be grown, a large permanently settled population is usually to be found. The Arab clothes himself mainly in homespuns, while his abba or cloak is always of home-made woollen fabric; his drinking and eating vessels are generally of pottery or of copper locally manufactured, the latter from imported metal. Tea and a good deal of gum and piece goods, some of Indian manufacture, are imported from India, as well as teak and mango wood, which come in native craft from the ports on the Malabar coast, while charcoal is brought from Karachi. There was considerable activity in British steamer traffic along the Karun river, and also in caravan trade between Ahwaz and Isfahan. The great disadvantage along this route is the lack of caravanserais, but it is hoped that the Bakhtiari Khans will be persuaded to erect suitable rest-houses ere long, and thus bring the road into increased favour. Robberies are few and far between on the Ahwaz-Isfahan road, and of rare occurrence in Arabistan except near Dizful, in the extreme north of the province.

Sounding of the Krakatau Basin.—The site of the vast subsidence which, after the great eruption of Krakatau in 1883, left a deep, sea-covered basin where the northern part of Krakatau island had previously been, was sounded soon after the catastrophe by the survey-ship *Hydrograaf*, and the results were published by Mr. R. D. M. Verbeek in his monograph issued in 1886.* But as the soundings then secured were too few to give an accurate idea of the some-

* The soundings thus obtained were shown in the sketch-chart published in the *Proceedings R.G.S.* for March, 1884 (p. 143).

what complicated submarine contours, an attempt was lately made by Dr. W. Van Bemmelen, the well-known Dutch expert in terrestrial magnetism, to re-survey the site of the eruption during the visit of a scientific expedition in 1908. Some difficulties were encountered, and in the time at his disposal Dr. Van Bemmelen was not able to obtain a really satisfactory number of soundings, but the *data* secured, which are summarized in the *Beiträge für Geophysik* (1910, part iv.), have enabled him to construct a contoured chart, which accompanies the note just referred to. They show that, within the partial ring formed by the three remaining islands, there is a central basin, oval in form, with fairly level floor and with depths exceeding 250 metres (136 fathoms) over a considerable area. The slopes of this basin vary greatly in steepness, the most abrupt drop occurring, as might be expected, off the precipitous northern point of the existing remnant of Krakatau island. Farther west, where a beach has been formed below the cliff, the submarine slope is also more gradual. An attempt to compare the results with those given by Verbeek showed at first remarkable differences, but these are removed if the positions of the earlier soundings are slightly shifted. The outline of the islands has been so far changed by the action of the waves that it is impossible now to test the accuracy of positions fixed with reference to these. Where an independent control was present, Dr. Van Bemmelen found, with two solitary exceptions, a remarkable agreement between the two sets of figures, so that no indication of a renewed movement of the sea-floor exists. This is in harmony with the fact that no fumaroles, hot springs, or other evidences of volcanic activity are to be seen on either of the islands. From the fact that the sites of the former volcanoes of Perbuwatan and Davan lie on the slopes of the present crater, Dr. Van Bemmelen suggests that their disappearance may have been due rather to a sliding movement than to vertical subsidence.

AFRICA.

The Geography of North-Eastern Morocco.—Recent French investigations have done something to correct the map of North-Eastern Morocco, which has hitherto been but imperfectly known, even within a short distance of the Mediterranean coast. Some of the latest additions to knowledge have to do with the lower course of the Muluya, the largest river of the empire, which has been shown from hearsay information as making a remarkable double bend within the last 50 miles before entering the sea. This part of the basin has lately been visited by M. A. Bernard, who gives the results of his journey, combined with information gathered from other quarters, especially that communicated by Commandant H. d'Etaules, in *La Géographie* for December, 1910. So far from describing the bends above referred to, the general course of the Muluya proves to be remarkably straight in this portion. The river here flows through a narrow gorge or gorges, making it extremely difficult to follow its course. Fed by the snows of the Atlas, the Muluya maintains its flow throughout the summer, despite the intense evaporation and the absence of feeders of any importance in its lower course. Its depth varies considerably, and it is liable to sudden and violent floods, especially in spring when the snows are melting. At its normal level it is fordable at many points. M. Bernard's paper also gives information on the general nature of the country between the Muluya and the Wed Kert, including the peninsula of Jebel Gelaya, west of Melila. This region—the "Garet" province of Leo Africanus—differs in many ways from the Riff further west, and its mountain chains seem to belong rather to the system of the Middle Atlas than to that of the Riff. The only European who has traversed them is the Marquis de Segonzac, and his investigations were much hampered

by hazy weather. Their direction seems to more nearly approach a meridional one than has been supposed, and there are thus considerable facilities, by means of the plains between them, for communication from north to south. Some of these plains are wide and fertile, and the current idea of the sterility of this region appears not to be justified. It does not seem to fall within the zone characterized by a steppe climate. The same rectification in regard to the course of the Muluya appears to have been made independently by the well-known geologist, M. Gentil, who gives the results of a recent examination of the same region in the *Comptes Rendus* of the Paris Academy for December 5, 1910. He considers that the chains of north-eastern Morocco really belong to the Middle Atlas, forming a connecting link between this and the Algerian Tell.

Origin of the Gulf of Suez.—Dr. John Ball, whose argument in favour of the erosional origin of the Gulf of Suez, no less than of the Nile valley, was referred to in the *Journal* for May, 1910 (p. 596), has recurred to the subject in the January number of the *Geological Magazine*. While a general agreement as to the erosional origin of the Nile valley has manifested itself, the idea has not met with such ready acceptance in regard to the Gulf of Suez (cf. note on Dr. Hume's paper in the December number, p. 731). Dr. Ball has, since writing the first paper, been again at work in the field, and though he has been unable, owing to the limited opportunities offered, to collect much additional evidence, such observations as he was able to make seemed to him corroborative of his first conclusions. His recent paper is, however, concerned chiefly with arguments based on the general configuration of the Gulf of Suez as revealed by soundings, and the differences noticeable between it and both the Red sea proper and the Gulf of Akaba. In the Gulf of Suez there is a progressive and regular deepening from the head downwards, and from the sides towards the median line; and, as Dr. Ball shows by a sketch-map, it is possible to reconstruct a former drainage system entirely in accord with the present contours of the bottom, and with the positions of the wadies descending to it on either hand. The depth is insignificant as compared with that of either the Gulf of Akaba or the Red sea itself, in joining which the floor of the Gulf of Suez makes quite an abrupt plunge. The Gulf of Akaba is a deep trough with a maximum depth of over 700 fathoms, and this occurs not at the lower end, but at about its centre, while a transverse horst separates it from the Red sea. Everything, therefore, seems to point to a different origin for the two gulfs. Dr. Ball thinks that the evidence that the Gulf of Suez occupies an anticline is little less conclusive, and also that the later geological history of north-eastern Egypt can be easily traced on the basis of his hypothesis, coupled with a belief in secular oscillations of the crust of this region, for which there is equally strong evidence.

Discovery of Major Gordon Laing's Grave.—It is reported in the *Temps* that in the course of an official mission to the salt-mines of Taudeni, M. Bonnel de Mézières has discovered the grave of Major Alexander Gordon Laing at a place called Saeb, situated about 30 miles north of Timbuktu. It will be recalled that Major Laing was murdered in 1826, early on the third day after leaving Timbuktu to return to Tripoli, whence he had set out the previous year. So much was known from native reports; but Laing had no white companions with him at the time of his death, and hitherto attempts to locate his grave have been unsuccessful. It is too much to hope that M. Bonnel de Mézières has found any traces of Major Laing's papers, which included an interesting collection of old documents gathered together at Timbuktu. Repeated efforts have been made to recover these papers, which are believed not to have been buried

with the explorer, but, according to reports current at the time, to have found their way into the hands of the Turkish authorities in Tripoli.

The Franco-Liberian Frontier.—An agreement finally settling the course of this long-disputed frontier, in accordance with the recommendations of the joint delimitation commission (*Journal*, vol. 35, p. 723), was signed at Paris on January 13 last. We hope to give a sketch-map showing the frontier in the next number of the *Journal*.

Captain Périquet's Expedition in French Equatorial Africa.—Last year an important expedition was despatched to French Equatorial Africa with a view to surveys and studies along the line of a possible railway route from Libreville across the basin of the Ogowe to the upper Sangha. Such a route would, it is thought, supply the best means of access to the interior of the French territories, avoiding, as it would, the long *détour* by way of the Congo, and reducing considerably the distance to be covered in the case of earlier schemes for a railway by a more southerly route. The command was given to Captain Périquet, already known for the part he took in Captain Lenfant's expedition for the survey of routes between the Congo and Shari basins. This officer, who is supported by several competent surveyors, has reported on the first stages of the undertaking to the Paris Geographical Society, and two of his communications are printed in *La Géographie* for December, 1910, and January, 1911. The expedition was divided into several sections, which carried out independent surveys in the north, south, and east of the region to be explored, between the Ogowe and the southern frontier of the Kamerun, and between Spanish Guinea and the upper Sangha. Special attention appears to have been paid to the basin of the Ivindo (the great northern tributary of the Ogowe) and the water-partings between this and neighbouring river systems. Among other districts, Captain Périquet had explored the tract of elevated country long known as the Serra do Cristal, which seems to be in reality the relic of an eroded plateau. Much difficulty was experienced through the absence of tracks through the forest or bridges over the streams, and one of Captain Périquet's coadjutors had to cut a way across an uninhabited stretch of 200 kilometres. Several of the routes led through the country of the Pahuins (Mpangwe, or Fans), who gave some of the parties but a cold reception. One result of the surveys is to show that the Ogowe and its affluents occupy a depression bounded by abrupt escarpments, but an important point to be determined is whether these are broken by sufficiently low passes to permit the passage of a railway. While pronouncing no definite opinion, Captain Périquet appears to be sanguine on this point.

The Duke of Mecklenburg's Expedition.—This expedition, the departure of which for the Congo, *en route* for the Lake Chad region, was announced in the *Journal* for August last (p. 220), has already reached its special field of research in the Central Sudan. A communication from the leader, despatched from Dekoa (Dikwa) in Borneo on October 28, and printed in the first number of the *Deutsche Kolonialzeitung* for the present year, describes the route of the main expedition by the well-established French route from the Ubangi to the Shari basin. Some difficulties seem to have been encountered on the score of transport, both by river and on land, though much praise is accorded to the fine road, with rest-houses at regular intervals, which has been opened up by the French authorities. Ethnological inquiries were made during the journey, and a trip into the Mandya country was carried out by Lieut. von Wiese, much difficulty being experienced owing to the flooded nature of the country. A part of the

expedition, consisting of Drs. Schultze and Mildbread, had separated from the main body in order to carry out scientific researches in the Southern Kamerun, after crossing which to the coast the two travellers are to devote themselves to collecting in the islands of Annobom, San Thomé, and Fernando Po. A first report on their experiences appears in No. 6 of the *Kolonialzeitung*. In December, 1910, they were at Molundu, in the south-east corner of the Kamerun. Much fog and cloudy weather, with daily thunder, had been experienced, though the rainy season proper was supposed to have terminated. The country had proved unfavourable for botanical and entomological work, though bird-life had been abundant, and the collections under this head were most satisfactory.

New Railway Scheme for the Belgian Congo.—An editorial article in the *Mouvement Géographique* for December 18 last describes and discusses a scheme lately set on foot for the construction of yet another line of railway with the object of opening up the remoter districts in the southern part of the territory. This would supply a central line of communication from west to east, between the Kabanga line in the south (under study at the present time) and the Great Lakes line in the north, the final section of which, from the Lualaba to Lake Tanganyika by the valley of the Lukuga, is now under construction. From the head of the lower Congo railway on Stanley Pool to the head of navigation on the Sankuur at Pania Mutombo (a little below the Wolf falls), transport would be effected, by means of steamers, along the navigable stretch of the Kasai system, and the only railway construction necessary would be that of a line through the heart of the rich and well-peopled province of Urua to Pweto on Lake Mweru. The country along this route seems to offer no serious obstacles, at least as far as the passage of the Mitumba uplands by the gorge of Kwikuru on the Luvwa after its exit from Mweru, and this is already traversed by a road suitable for wheeled traffic, which is said to afford a quite possible route for the railway. An important point on the line would be Ankoro, at the passage of the Lualaba, just below the junction of the two upper branches. This would be effected either by a ferry, or by bridges at a point where the river is divided into two by an island. If the scheme were carried out, Ankoro would become the chief centre of Urua. Application for a concession has already been made to the Belgian Government, and M. Wauters strongly urges the immediate adoption of the project. There is no doubt much to be said in its favour, though the opening of three trunk-lines, running more or less parallel and, in part at least, at no great distance from each other, would seem something of a luxury. The central line now proposed would supply a shorter route to Tanganyika than the line under construction, and, with a branch to the south, might, one would think, have also served in the case of Katanga.

The "Pans" of South-West Africa and Past Changes of Climate.—A well-known feature of the arid regions of South-West Africa is the "pans" or roundish depressions, frequently lined by a deposit of limestone, which in many parts form almost the only available watering-places for travellers. Those of Eastern Damaraland have been studied by a young German, Dr. H. Michaelsen, who took part in the military operations during the recent disturbances in the German territory, and though his conclusions (put forward in Part 3 for 1910 of the *Mitt. aus den Deutschen Schutzgebieten*) only profess to be tentative, they are of interest in view of the uncertainty which has hitherto prevailed as to the mode of origin of the pans, in spite of the degree of elucidation the question has received at the hands of German travellers like Schinz, Fleck, Schultze, and especially Passarge. Dr. Michaelsen first describes minutely certain typical pans examined by him, and then proceeds to discuss the general questions connected with them, including

that of past changes of the climate of this part of Africa. The pans of Eastern Damaraland stand, as a rule, in close relation to the river-beds of this region, known locally under the Dutch term "rivier," and offering characters differing from those of the "Omurambas" of the country further north. They may occur either at the point of origin or termination of the river-beds or at some intermediate part of their course, though some seem to be quite independent of a river-system. They are in all cases surrounded by the deep red sand characteristic of Eastern Damaraland, and this mostly also forms the substratum below the lining of tuff and limestone, though a bed of impervious sandstone sometimes intervenes, and there are indications that the granite foundation of the country lies at no great depth below. In their floors, a marginal zone is to be distinguished from the central area, chiefly in the tubular structure of the tuff of the former. In discussing their age, Dr. Michaelsen points out that the descriptions of travellers in the early part of the nineteenth century show that the pans were then in a different condition as regards water-supply, etc., from the present, and from the slight amount of water-erosion traceable in the region, he places their formation at a time well within the historical period, when the rainfall was but slightly greater than at present. The "Omurambas" of farther north, with their wider, more clayey beds, seem to belong to an earlier period of greater rainfall, and to point to a past climatic oscillation in this part of Africa. Although presenting external resemblances to the pans described by Passarge, there seem to be important differences, both in age and mode of occurrence, and Dr. Michaelsen does not accept the hypothesis of the latter—that the pans have been formed by the agency of wild animals—as an explanation of their origin in Damaraland. He considers that hollows in the sand were originally produced by wind action (the substratum of sandstone being probably formed as a sort of crust, on or slightly beneath the surface, by the cementing action of carbonate of lime), and that they became filled with water from which the tuffs were in course of time deposited; the difference in structure between the central and outer deposits being due to the growth of reeds, etc., round the margin. The pans are at present being rapidly destroyed by denudation, and the miniature cliffs, topped with hardened tuff, which commonly surround them, are thought to mark a stage in the process, being the remnants of the former banks of tuff deposited round the pans. Since the above was written, Dr. Michaelsen's views have been criticized by Dr. Passarge in an article in *Globus*, to which Dr. Michaelsen has replied.

AMERICA.

Supplementary Notes on Mount Sir Sandford.—Owing to the impediments of trans-Atlantic correspondence, the February issue of the *Journal* was in the press when the final revision of Mr. Palmer's paper "Explorations about Mount Sir Sandford" was received. The following additions and corrections, therefore, should be made in connection with the paper. In the fourth paragraph of the paper read "improved" for "improving." In the second paragraph, under heading "3. Geographical Description," read "eastern tributary" for "western tributary." "Mt. Silverhorn" on the map should read "Mt. Silvertip," to agree with the glacier and the *névé*. "Viddette peak" should be spelt with one *d*, and "Bastian" with an *o* in the last syllable. The writer appends the following: The statement characterizing Sir Sandford glacier as the largest in the range is believed to be literally true in its broadest sense. To avoid possible ambiguity, however, it may be stated that a glacier's true upper limit is deemed to be the water-parting of its gathering-basin, if the ice or *névé* extend so far. The frontal moraine of the glacier is smooth and

usually free from terminal ridges, a condition which may be due to stream action. The lateral moraines are well defined, particularly on the east side, where at a point some distance below the present termination of the ice three or four distinct parallel crests may be counted. These gradually coalesce in an up-stream direction until only one remains. In this vicinity the surface accumulation from the Bastion becomes mingled with the lateral, and the ice, as a result of the increased protection, attains a greater thickness and length along this side. At the junction of the Dainard glacier the right lateral executes an extraordinary spiral curve of more than 180°, like a bent fish-hook. To the observer on the spot, no ready explanation occurs why the ice should not take the shorter course directly across the loop, since the moraine itself is the only apparent obstruction. This moraine is practically continuous for about 3 miles. The left lateral is small in comparison. A fragment appears at the union of the Silvertip glacier, indicating, from its position high up on the mountain-side, a much greater thickness of the neighbouring ice at an earlier stage of glaciation. About Sir Sandford, as is often the case where a single alpine summit towers high above its neighbours, atmospheric conditions were unstable. Local storms, accordingly, were frequent. They came almost without exception from the south or south-west, accompanied by strong winds, and usually consisted of a series of thunder squalls (afternoon and early evening were likely times), with hail and rain, lasting for an hour or two. One day we had six such storms, punctuated by intervals of complete clearing. There were, however, no long periods of continually bad weather. Out of twenty-three days fourteen were clear or cloudy, on six there were showers, and on three it rained hard. This record, compared with experience in other portions of the range by the writer and others (*Proc. R.G.S.*, 1889, p. 168), goes to indicate a greater tendency to stormy weather here. The average temperature, taken irregularly on fifteen days between 6 and 9 a.m., was 49°. The map purports to be nothing more than a rough sketch-map. The general relations between the principal features of the terrain are correctly shown, but details and distances may vary considerably from the truth. There is reason to believe that some foreshortening exists towards the north-east, and a corresponding forelengthening on the south-west. As the map was drawn from the original sketch and did not receive the author's revision, discrepancies between it and the paper will doubtless be found. These should be resolved in favour of the latter. Distances along the routes were estimated by different persons after several traverses, and then averaged. Directions as mentioned in the paper are magnetic. The variation is 25° 5′ E. (Wheeler). Most of the names were bestowed by the party on the spot. The others the writer has ventured to suggest as appropriate.

Study of the Artesian Waters of Argentina.—Although a large part of Argentina is well, or fairly well, provided with water, there is also a large area, marked in part by the saline formations which occupy a belt in the central and west central parts of the country, and including also a large part of northern Patagonia, in which the surface supply is exceedingly scanty. For the further development of the country, a knowledge of the underground resources in the matter of water, especially of the artesian supply that might be utilized, is of the first importance, though the geological surveys so far carried out have not supplied even the most elementary data as regards topography and structure necessary for the solution of the question. The Minister of Public Works, Señor Ramos Mexia, has therefore adopted a scheme for the examination of artesian conditions along the lines of railway which have been built at so much expense

by the Government. Much of the country to be examined presents certain analogies with parts of the United States which have to depend on an artesian supply, and it is proposed to follow the example set by the United States Geological Survey in the execution of the needed surveys. Señor Mexia having applied to the United States Government for the services of a geologist and such assistants as might be necessary, an arrangement has been made under which the work will be set on foot by Dr. Bailey Willis, supported by a competent staff of geologists and topographers. Dr. Willis was in London early in February, *en route* for the sphere of operations, and he has undertaken to devote two years to the examination of the artesian possibilities in the districts to be designated by the minister. The surveys will be carried out on strictly scientific lines, and, apart from their immediate object, attention will be given to the general question of the development of the natural resources of the country. Valuable results both from a geographical and from a geological point of view may thus be anticipated. As stated above, the work is being inaugurated by the Minister of Public Works, while the existing Bureau of Mines, Geology and Hydrology is under the Ministry of Agriculture. It is hoped, however, that the activities of the two organizations will be mutually helpful.

AUSTRALASIA AND PACIFIC ISLANDS.

The Northern Territory of Australia.—After negotiations extending over a considerable period, the necessary measures for the transfer of the "Northern Territory" from South Australia to the Commonwealth Government were completed towards the end of last year, and the transfer was formally proclaimed at Port Darwin on January 2. The Australian papers have since given details of various steps which are contemplated with a view to the further development of the territory. They include systematic exploration of parts of the area, and this has been entrusted to Captain H. V. Barclay, whose previous work in a similar direction is well known (cf. *Journal*, vol. 26, p. 222). Captain Barclay will make Newcastle Waters his base, and his first task will be the examination of the stock route from Victoria Waters to Anthony's lagoon, and, if possible, the improvement of the water-supply along it by the digging of new wells. He will then explore the country northward from Anthony's lagoon towards the McArthur river and the Borraloola settlement. If the country in this direction should prove to be equally promising as regards fertility and stock-rearing capacity with that to the south, it is intended to take steps for the opening of a trading port at the mouth of the McArthur. Such a port would, it is thought, tap a large area of country, and would soon repay the necessary outlay.

Soundings in the Western Pacific.—The important work done by the German survey ship *Planet* since her arrival in the western Pacific has already been referred to in the *Journal* (vol. 34, p. 91; 35, p. 82). It has since been continued during various cruises between Sydney, the New Hebrides, and German New Guinea, and the preliminary results have been recorded in the *Annalen der Hydrographie* (1910, Part 3; 1911, Part 1). The soundings carried out in 1909 in the vicinity of the New Hebrides, and between Bougainville of the Solomon group and New Guinea, were not sufficiently numerous to give an adequate knowledge of the complicated submarine contours between the island groups in question, and opportunities were therefore taken in 1910 to add to their number. Among other results, the limits and character of the deep trough brought to light to the south of Neu Pommern (New Britain) have been defined with greater accuracy than previously. Towards its western end (in about

149° E.), and again throughout most of its central portion, it has a depth of over 7000 metres (3828 fathoms), whilst after bending southward in about 153° E., it becomes both wider and deeper to the west of Bougainville island. The maximum depth obtained here was 9140 metres, or 4998 fathoms. In the neighbourhood of the New Hebrides, where the existence of a similar trough had been suspected by seismologists, a search to the east of the group in 1909 had failed to bring one to light. In 1910 the search was renewed on the western side, and here a trough attaining a depth of 7570 metres (4139 fathoms) at its southern end was found to run between the New Hebrides and the Loyalty islands. Further north the sea became shallower, though a sounding of 6880 metres (3762 fathoms) was obtained between San Cristoval and Rennell islands west of the Santa Cruz group. Between Neu Mecklenburg and Jaul or Sandwich island to the south no depths much exceeding 1500 metres were found, and as this seems the limiting depth of most of the channels between the groups in this part of the area examined, it is suggested that these were once united, but have been separated by a subsidence of about 1500 metres. Observations of bottom temperatures confirmed the fact previously indicated, that in the isolated troughs the temperature slightly increases with the depth, which seems to show that the bottom layers are affected by the Earth's interior heat. Samples of the bottom deposits were also secured in most cases.

POLAR REGIONS.

Russian Expedition to Novaya Zemlya.—A Russian expedition was successful last summer in circumnavigating the northern island of Novaya Zemlya in the *Queen Olga*, Captain Sedov, who, as stated in *Petermanns Mitteilungen* for December, had previously carried out surveys on the northern coast of Eastern Siberia. A statement has been made in the daily press, on the authority of Mr. Rusanof (apparently a member of the same expedition), that the open water found off the northern coast of the island proves that the Gulf Stream passes to the north of Novaya Zemlya. That such a statement can have little valid foundation (few if any scientific observations having been made during the rapid voyage round the island) seems sufficiently obvious, and it appears that various Russian scientists, including General J. de Shokalsky, have pointed this out in the Russian papers. The experiences of various earlier voyagers would seem to show that the state of things described must be somewhat exceptional. The note in the *Mitteilungen* also mentions that the Governor of Archangel, Mr. J. W. Sosnovski, likewise visited Novaya Zemlya for the purpose of forming a Russian settlement, and that several settlements of Norwegian sealers were found along the coast during the voyage of the *Queen Olga*.

The German Antarctic Expedition.—We have received a memorandum on the present state of the preparations for this expedition, lately printed in Berlin. As is already known to readers of the *Journal*, the general object of the expedition is to push as far as possible south by way of the Weddell sea towards the centre of the Antarctic continent, and in particular to determine the relations which exist between the eastern and western portions of the supposed mass of land. The expedition will start during the spring and proceed to Buenos Aires, executing oceanographical researches during the voyage. At the beginning of the southern summer the ship will proceed south and will endeavour to reach the edge of the ice-pack in November, in which month the ice conditions seem to be particularly favourable. It is hoped to visit Coats Land, and, tracing its coast as far as possible to the south or south-west, to establish a base station, where scientific observations of all kinds may be carried on for

at least a year, and which may serve as a starting-point for the sledge-expeditions. The landing-party will number eleven, of whom seven will carry out the work at the station, while four will form the southern sledge-party. If possible, the ship will return north for the purpose of oceanographical work, but should it be frozen in at a distance from land, the whole party will be obliged to winter on board. The scientific programme, details of which are given, includes, besides the strictly geographical work, research in geology, oceanography, biology, meteorology, magnetism, etc. Special attention will be paid during the outward voyage to soundings in the Atlantic sill between 0° and 10° N., and, if time permits, an attempt will be made to define the sill which separates the Brasilian from the North-American basin. The whole of the scientific staff has already been selected. The leader, as is known, is Lieut. W. Filchner, and he will be supported by Dr. Barkow, of the Royal Prussian Meteorological Institute, as meteorologist; Dr. W. Brennecke, of the Deutsche Seewarte, as oceanographer; Dr. Heim, as geologist; and by several other scientists. The ship will be under the command of Captain R. Vahsel, who took part in the first German expedition in the *Gauss*, and has had considerable experience of ice-navigation. The ship, which was purchased last autumn in Norway, is a whaler, built in 1905 of fir, oak, and pitch-pine, strengthened for ice-navigation, and cased in greenheart. Its fittings have been specially adapted for the purposes of the expedition. Among the equipment is an installation for wireless telegraphy, and both dogs and Manchurian ponies will be taken for sledge transport. Specially constructed motor-vehicles are also included. It is evident that no pains have been spared in equipping the expedition for its task.

The Japanese Antarctic Expedition, to which reference was made in the January number, p. 99, sailed from Wellington, N.Z., on February 11. In spite of the small numbers and meagre equipment, the members of the expedition are said to be determined and confident of success.

GENERAL.

Amalgamation of German Geographical Serials.—From the beginning of this year the German serial *Globus*, which had just completed its 98th volume, has been amalgamated with *Petermanns Mitteilungen*. This is no doubt a step in the right direction, for however much we may regret the disappearance of so long-established and useful a paper, the multiplication of publications dealing on similar lines with similar subjects is undoubtedly a mistake.

Errata in the February Number.—In Mr. Reed's paper on "Cotton Growing," p. 139, the date in the second line of the second paragraph should be "1908"; and in the fifth line from the bottom "house" should read "home." In Dr. Falconer's paper on Nigeria, pp. 181–2, for Figs. 1 and 2 read, respectively, Figs. 3 and 4, and *vice versâ*.

OBITUARY.

Sir Francis Galton, F.R.S., etc.

By the death of Sir Francis Galton, which took place on January 17 last in his eighty-ninth year at Haslemere, the Society loses one of its oldest members. It is only two years ago that Galton's career was noticed in these pages (vol. 33, p. 205), in a review of his 'Memories of My Life.' It is not needful to repeat at length what was then written with regard to his travels and his services on the Council.

Some details as to his life and his official connection with the Society may, however, appropriately be added. Born in 1822, the son of a Birmingham banker and the daughter of Erasmus Darwin, he was sent to King Edward VI.'s school in his native town. He subsequently studied medicine for a short time at King's College, London. In 1840 he made a short tour to Athens and Constantinople, and on his return went up to Trinity College, Cambridge, where, in 1843, weak health having prevented him from attempting mathematical honours, he took a poll degree. Two years later he visited the Sudan. In 1850 he joined the Geographical Society prior to his first and only serious journey of exploration, two years' sojourn in Damara Land, Ovampo Land, and Namaqua Land. This was recorded in 'The Narrative of Exploration in Tropical South-west Africa,' which obtained for its author one of the Gold Medals of the Society in 1853. The contrast is striking between the modest book, with the conventional chromolitho graphs of the period, and the ponderous and splendidly illustrated volumes in which some modern Medallists record their travels. But those who are tempted to dip into Galton's pages will be rewarded by many vivid pictures of African travel and characteristic glimpses of the author. For example, though the chief objects for which the journey was undertaken were, we are told, "love of adventure" and sport, Galton even at that date "professed to be a scientific man." He tells us that wishing to take accurate measurements of the figure of a Hottentot lady, and being shy of adopting the direct method, he "took a series of observations upon her figure in every direction, up and down, crossways, diagonally and so forth, with a sextant; this being done, I boldly pulled out my measuring tape, and measured the distance from where I was to the place where she stood, and having thus obtained both base and angles, I worked out the results by trigonometry and logarithms." The future writer of the 'Art of Travel,' and Editor of 'Hints to Travellers,' is further indicated by the frequent references to kit and appliances found throughout the work, among which it is odd to note the use of field-glasses recommended as a novelty.

In 1854, Galton was elected on the Council of the Society, on which he sat for many years in different capacities. From 1857 to 1862 he was an Hon. Secretary; in 1865–66, Foreign Secretary, and between 1866 and 1886 three times a Vice-President. He did not finally resign his seat until 1893, when increasing deafness incapacitated him from any longer taking part in discussions. In the general business of the Society Galton's attitude was primarily critical. His disposition led him to consider curiously every objection that might occur to his acute intellect to any fresh proposal that was brought forward. He was, as a rule, suspicious of novelties, but when an innovation proved successful he would be among the heartiest to support it. In one respect he was mainly responsible for the adoption of a very important development in the action of the Society. The Council up to 1867 had confined its educational efforts to the technical instruction of 'Intending Travellers.' From 1868 onwards up to the present time, it has used its best efforts to secure for Geography its proper place in National Education. The first attempt, made at Galton's instigation, was, it must be confessed, a comparative failure. The grant of "Public School Medals" was found to produce no adequate results. It was, therefore, after about fifteen years, superseded by a scheme (constructed with the help of the late Mr. E. Hale, of Eton), for attacking the problem through the Universities. This scheme, with additions, is that still in force, and it has produced very satisfactory and yearly extending results throughout Great Britain. Others may have been responsible for the successful issue, but it was Galton who initiated our educational policy, and to him in large measure is due the credit of having first

brought his somewhat reluctant colleagues to accept the large responsibilities involved in it.

The service to travellers by which Galton will be longest remembered was undoubtedly his 'Art of Travel,' which passed through three editions, and was in a sense the foundation to the 'Hints to Travellers,' which have been so frequently republished, and so largely increased during the last forty years. As the result of a Pyrenean tour he planned a form of sleeping-bag, which with certain improvements invented by Mr. F. F. Tuckett has come into almost universal use among mountain explorers. Though at one time a member of the Alpine Club, Galtonwas never an enterprising climber, and limited his endeavours in this direction to measuring the avalanches of the Jungfrau. In 1861–64 he edited two volumes of miscellaneous papers entitled 'Vacation Tours,' in one of which he described a visit to Spain to observe a total eclipse of the sun.

Into the diverse activities which occupied the larger portion of Galton's life this is not the place to enter. He made important contributions to meteorology. But the main bent of his intellect was towards the study now termed Eugenics; the improvement of humanity by breeding, or, in other terms, the assistance of Evolution with regard to mankind by the forces of legislation and public opinion. Incidentally this directed him to the study of finger-prints, an investigation which has led to practical results in the identification of criminals.

Sir Francis Galton served the British Association as President both of its Geographical and Anthropological sections. He was a Fellow of the Royal Society, a D.C.L. of Oxford, and a D.Sc. of Cambridge. In his 88th year the State recognized his scientific eminence by conferring on him a Knighthood. He married, in 1853, Louisa, a daughter of the Very Rev. G. Butler, Dean of Peterborough, and sister of the Master of Trinity.

D. W. F.

Rev. Hereford Brooke George.

The death of the Rev. Hereford B. George, Senior Fellow of New College, on December 15, 1910, removes one of the pioneers of geographical teaching in Oxford. Mr. George was born on New Year's Day, 1838, and was educated at Winchester and New College. He took honours in classics and mathematics, was admitted full Fellow of New College in 1838, and was called to the Bar in 1864. After three years' practice, however, he returned to a tutorship at New College, which he held till 1891. He took Holy Orders in 1868, and was the first "Oxford Don" to avail himself of an alteration of Statute, passed in the same year, permitting a tutor to marry without vacating his Fellowship. Educated though he had been in the strictest circle of the older academic tradition, Mr. George will be remembered in Oxford as an early and lifelong advocate of more modern methods, in teaching and in University business. He took active part in the transformation of New College from the smallest and most exclusive to one of the most distinguished of Oxford societies, and has recorded the change in a striking little history, 'New College, 1856–1906,' published on the completion of the fiftieth year of his Fellowship. He was also one of the first of the "intercollegiate lecturers," whose organization has done much to permit advanced and specialized teaching; and he worked hard to create and maintain the standards of the Oxford Local Examinations, to promote the education of secondary teachers, and to support the University Volunteer Corps, of which he was an original member, and long a familiar and imposing figure. In later life the Oxford Kriegspiel Club naturally claimed much of his leisure, and kept him in contact with younger generations of volunteers. The intercollegiate organization of University teaching enabled

Mr. George, with many of his contemporaries, to specialize, and his work as an historian soon centred round his favourite study of military history and historical geography. He was a clear and vigorous lecturer, with enough personal experience of travel and tactics to bring fresh air into his classroom. It was an aspect of historical study which lay apart from the constitutional researches of Stubbs and his pupils, whose influence predominated in the Oxford School, and it was some time before Mr. George's work was appreciated as it deserved. University lectureships on special subjects were rarities, not to say curiosities, until he was past his prime; and the Oxford School of Geography was not constituted until some years after he had resigned his College Tutorship. Among his published work, nearly all produced after his college career was ended, should be noted his 'Battles of English History' (1895), 'Napoleon's Invasion of Russia' (1899), and suggestive essays on 'The Relations of Geography and History' (1901) and on 'Historical Evidence' (1909).

Outside Oxford Mr. George was well known as an Alpine climber. His first visit to Switzerland was in 1860, at the end of his undergraduate career, and among his most notable climbs were the first crossing of the Jungfrau Joch two years later, and the ascent of the Jungfrau itself from the Wengern Alp. In 1863 he was chosen to be the first editor of the *Alpine Journal*, which he conducted for four years. His Alpine interests never failed him, and he was the perpetual President of the Oxford Alpine Club, from whose dinners he was never absent. His book on 'The Oberland and its Glaciers' (1866) is well known. J. L. M.

Dr. Samuel McFarlane.

One of the pioneer missionaries, to whose labours geography has been so largely indebted in the past, has passed away in the person of the Rev. S. McFarlane, LL.D., who died at Southport from an attack of pleurisy and pneumonia on January 27, aged 73 years. He had been a Fellow of our Society, to which he had previously been known for his geographical work in New Guinea, from 1886 to 1899. He resigned in the latter year on the election, as Fellow, of his eldest son, now superintendent of the London Medical Mission in North China.

A native of Scotland, McFarlane removed to Manchester at an early age, and having decided to devote himself to the work of a missionary, received an appointment, in 1858, under the London Missionary Society—the body which has sent forth so many of the great pioneers in the field of missionary-geographical enterprise. Before setting out for the western Pacific, where the Society was then contemplating a forward movement, he was married to Miss Joyce of Bedford, who sailed with him at the end of December, 1858, and afterwards shared all his labours. They settled at Lifu, in the Loyalty group, meeting with considerable success in their work among the uncivilized natives, into whose language Mr. McFarlane completed a translation of the New Testament in 1866.

Troubles having arisen with the French governor of New Caledonia, owing to Mr. McFarlane's outspoken protests against the treatment accorded to the missionaries and their converts, the latter was transferred, in 1871, to New Guinea, where the London Missionary Society had for some time been desirous of opening a new mission. Here he worked with characteristic energy and determination, and, in spite of immense difficulties arising from the unhealthiness of the climate, the savagery of the people, ignorance of their

languages, and other causes, had the satisfaction of seeing the mission firmly established, with an efficient organization and a large number of stations, before finally leaving in 1886. During his residence in New Guinea McFarlane was active in exploring the then almost unknown coasts and interior of the vast island. In this he was helped by the generous gift of Miss Baxter, of Dundee, in the form of a small steamer (subsequently supplemented by a schooner) for the use of the mission. In the *Ellangowan*, as the steamer was named, he ascended many of the rivers which debouch on the south coast, in the hopes of finding healthy ground for a settlement beyond the great low-lying plain stretching behind the coast of the Gulf of Papua. In this he was not successful, but the voyages of the *Ellangowan* did much to improve the knowledge of New Guinea geography, especially by the ascent of the Fly river in 1875, which was the subject of a paper read before this Society in the following year (*Proceedings*, vol. 20, pp. 253–266). Another of the rivers examined was the Baxter, which name it then received in honour of the donor of the steamer. A second paper, describing a voyage in the *Ellangowan* to China straits, was printed in vol. 21 of the *Proceedings*.

After visiting the Australian colonies and the United States, Dr. McFarlane returned with his wife to England in 1888, but continued to work energetically in this country on behalf of the London Missionary Society. He was the author of two books, 'The Story of the Lifu Mission' (1873), and 'Among the Cannibals of New Guinea' (1888).

Count von Götzen.

The well-known German African traveller and administrator, Gustav Adolf, Graf von Götzen, died in December last after a serious illness, at the early age of 44 years. His first African journey was undertaken in 1891, when he made a hunting trip to Mount Kilimanjaro. He soon afterwards planned a more ambitious expedition, the route of which was so chosen as to pass through some of the most interesting and least-known districts of Eastern and Central Africa. A start was made at the end of 1893, the traveller's destination being the then unknown country of Ruanda, north of Lake Tanganyika. In order to reach this he took a route through the little-known area of inland drainage in the northern part of the German protectorate, and he was able to add considerably to our knowledge of its volcanic peaks, salt lakes, and other features. West of the Victoria Nyanza a virgin field lay before him, and among the results of the journey were the discovery of the mountain-girt Lake Kivu, the acquisition of the first definite knowledge of the Kirunga volcanoes, and the first authentic description of the interesting country and people of Ruanda. The journey was continued to the upper Congo across the great equatorial forest, considerably to the south of the portion traversed by Stanley, and the belt of unknown country extending east of the Lualaba, between Nyangwe and the Equator, was thus for the first time crossed by the track of a European. Descending the Congo to its mouth, Count von Götzen completed a traverse of equatorial Africa from east to west, at a time when the feat was by no means so easy of accomplishment as at the present day. The journey was described at length in the interesting volume 'Durch Afrika von Ost nach West.'

In 1900 Count von Götzen was appointed to succeed General von Liebert as Governor of German East Africa, and his six years' term of office was marked by the serious rising of the natives of the protectorate, only put down with difficulty. An account of this rising appeared from his pen in 1909.

CORRESPONDENCE.

Observations on Plants.

Home Close, Heronsgate, Herts. January 19, 1911.

Scientific gardening has increased in England by leaps and bounds of late years, and special attention is being directed just now to the variations in plants which can be produced by the action of environment, even when this is of a purely artificial character. Travellers, and more especially explorers who reach high altitudes, can be of great assistance here, and I should like, if I may, to call their attention to the matter through the columns of our *Journal*.

Numberless experiments have demonstrated that by moving plants from the coast inland, or from the lowlands to high altitudes, and *vice versâ*, they can be got to assume characters which it is difficult to believe are "reversions" to ancestral form. Deductions of great value have been drawn from the results, but it appears now that in a large number of the experiments one important factor has not received the attention it deserves. Aspect has been carefully considered, but hitherto no differentiation has been made between the hours of the day in which a plant has been in direct, as distinct from diffused, sunlight. Yet some experiments which were brought to the notice of the Botanical Section of the British Association at the Dublin Meeting of 1908 showed that marked and persistent effects upon the coloured sap of some plants can be produced, at an altitude of 4500 feet, by limiting to selected hours of the day the amount of direct rays from the sun which are allowed to fall upon them. Explorers can help to elucidate this point even though their knowledge of botany may happen to be small. The predominance of a particular colour at a certain altitude, a variation in the hue when exposed to differences in the hours of insolation and in nothing else, and the exact distribution of their characteristic colours between the different petals, are all points which are easily noted, and might prove of the greatest value to investigators. Mr. Douglas Freshfield once told me that he had observed that at very high altitudes flowers of a blue colour were most prevalent.

I feel sure that many readers of the *Journal* would value any references to these and similar points regarding plant-life which might be noticed.

H. E. Rawson, Colonel.

The Terms "Denudation," "Erosion," "Corrosion," and "Corrasion."

Thornton, Hallamgate Road, Sheffield.

Prof. Gregory's article on the above-mentioned terms (*Geographical Journal*, 37 (February, 1911), p. 189) is valuable, as showing the laxity with which they are often used, but, while all must admit that accuracy is desirable, we should avoid the endeavour to put language into a strait waistcoat. I write to protest against his suggested limitation of the word "erosion" to lateral and "corrosion" to vertical action. If his suggestion were adopted we could in future never say that a river-valley was due to river erosion, but should have to add "and corrosion." Those who delight in "act and deed," "will and testament," may welcome such an innovation, but it appears to me quite unnecessary.

The two kinds of action, vertical and lateral, are often inextricably united. When a pebble in a stream is whirled round by the water in a pothole, does it erode the sides and corrode the bottom of the pothole? Must we say that a glacier corrodes underlying but erodes lateral portions of its bed?

I think "erosion" should include action both vertical, lateral, and in any direction, and that "corrosion" should be confined to chemical action.

The word "corrosion" conveys to me more than "solution." I should understand that a corroded surface had not only been partially dissolved, but also pitted more or less like a "limestone pavement" (Karrenfeld).

B. Hobson.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1910-1911.

Fifth Meeting, January 16, 1911.—Major Leonard Darwin, President, in the Chair.

Elections.—*William Henry Boyle; J. H. Miller; Joseph Whalley; Henry Richard Willatts; Rev. John Wallace Wilson; Rev. R. Stewart Wright.*

The paper read was—

"The *Michael Sars* North Atlantic Deep Sea Expedition." By Sir John Murray, K.C.B., and Dr. Hjort.

Sixth Meeting, January 30, 1911. Major Leonard Darwin, President, in the Chair.

Elections.—*Thomas Walter Barber; Vice-Admiral H.S.H. Prince Louis of Battenberg; Herbert Campbell; John W. Crowfoot; William Stove Legrand; Henry Hewitt-Dean; Ewart D'Aguilar E. Jukes; J. R. Luchsinger; Guy Magee, jun.; Arnold J. Marks; Edward Montague; Thomas Ernest Price; George Renwick; George McArthur Scales; Cecil Henry Farrer Thompson; W. A. Thornton; E. Coppee Thurston; Francis Robert Tutton; Adolf Vischer, M.D.*

The paper read was:—

"Recent Explorations in Dutch New Guinea." By Dr. H. A. Lorentz.

Sir Francis Galton.

The President said: Before proceeding to the business of the evening, I cannot help making a brief allusion to the loss the Society has sustained in the death of Sir Francis Galton. The name of Galton will, I presume, be known in coming generations chiefly as the originator of the science of eugenics. But any Fellow of the Society when reading his autobiography must, I feel sure, have felt extremely pleased at the way in which he acknowledged his debt of gratitude to this Society for the help it gave him in organizing his well-known expedition to Damaraland, and for the award of our Gold Medal for that expedition. He looked upon that as the start in his scientific career, whilst, in truth, it is the Society which ought to feel grateful to him for all he did as Honorary Secretary and Member of Council of the Society. After he had written his book on the 'Art of Travel' he helped to initiate our 'Hints to Travellers'—a work which has been published ever since those early years. He was one of the originators of the educational policy of this Society, and worked very hard at bettering the teaching of Geography in England. This is not the time to dwell on such subjects, and I would rather to-night allude to him as a charming companion, a sincere friend, and one always ready to help in times of trouble.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are as a rule written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C.R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
k.k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Austria—Bohemia. **Monroe.**

Bohemia and the Čechs: the history, people, institutions, and the geography of the kingdom, together with accounts of Moravia and Silesia. By Will S. Monroe. London: G. Bell & Sons, 1910. Size 8 × 5½, pp. xxii. and 488. *Illustrations.* *Price 7s. 6d. net.*

Austria—Dalmatia. **Ludwig Salvator.**

Der Kanal von Calamotta. [By the Archduke Ludwig Salvator.] Prague: H. Mercy Sohn, 1910. Size 11 × 8½, pp. 44. *Illustrations.* *Presented by the Archduke Ludwig Salvator.*

Fully illustrated from photographs, like the rest of the Archduke's publications.

Carpathians. *Jb. Ungar. Karpathenv.* **37** (1910): 85–126. **Komarnicki and Serényi.**

Das Trümmertal. Von Dr. Gyula v. Komarnicki und Dr. Jenö Serényi.

A topographical description of a section of the Carpathians.

Carpathians. *C.R. IX^e Congrès Int. G.* **2** (1910): 134–142. **Martonne.**

Sur la position systématique de la chaîne des Karpates. Par le Professeur E. de Martonne.

Central Europe—Frontier. *Petermanns M.* **56** (1910): [i.] 113–116, 176–179. **Frobenius.**

Die österreichische-italienischen Grenzgebiete. Von Oberstleutnant a. D. H. Frobenius. *Map.*

Denmark. *Petermanns M.* **56** (1910): [i.] 292–295, 345. **Frobenius.**

Dänemark. Militärgeographische Studie von Oberstleutn. a. D. Frobenius. *Maps.*

Eastern Europe—Greeks. **Myres.**

Greek Lands and the Greek people. An inaugural lecture delivered before the University of Oxford, November 11, 1910. By J. L. Myres. Oxford: Clarendon Press, 1910. Size 9 × 6, pp. 32.

See notice at p. 199, *ante*.

Europe—Historical. **Palmer.**

Lands and their stories. Book V. Europe and its peoples. By H. W. Palmer.

London: Blackie & Son, 1910. Size 8 × 5, pp. 288. *Sketch-maps and Illustrations. Price* 1*s.* 8*d. Presented by the Publishers.*

France—Dauphiné. *C.R. IX^e Congrès Int. G.* **2** (1910): 289–296. **Jacob.**

Etudes récentes sur les glaciers du Dauphiné, 1903-1907. Par Charles Jacob.

France—Geological History. *Ann. G.* **19** (1910): 350–358. **Passerat.**

La transgression de la mer des Faluns dans la région de la Loire. Par C. Passerat. *Map.*

On a Miocene invasion of the sea in the region of the middle Loire.

France—Levelling. *C.R. IX^e Congrès Int. G.* **2** (1910): 33–51. **Lallemand.**

Le nivellement général de la France, ses progrès de 1899 à 1908. Par Ch. Lallemand. *Maps, Illustrations, and Diagrams.*

France—Mentone. **Müller.**

Mentone and its neighbourhood: the past and the present. By Dr. George Müller: edited by Rev. J. E. Somerville. London: Hodder & Stoughton, 1910. Size 9 × 6, pp. xvi. and 464. *Map and Illustrations. Price* 12*s. Presented by the Publishers.*

France—Mistral. *Petermanns M.* **56** (1910); [i.] 297–298. **Knoch.**

Der Mistral Südfrankreichs. Von Dr. Karl Knoch.

France—Mountain surveys. *C.R. IX^e Congrès Int. G.* **2** (1910): 99–106. **Vallot.**

Les progrès recents de la topographie et de la Géodésie de Haute Montagne en France. Par Henri Vallot.

France—Southern. **Betham-Edwards.**

Unfrequented France by river and mead and town. By [Matilda] Betham-Edwards. London: Chapman & Hall, 1910. Size 9 × 6, pp. x. and 204. *Illustrations. Price* 10*s.* 6*d. net. Presented by the Publishers.*

Iceland. **Küchler.**

In Lavawüsten und Zauberwelten auf Island. Von Carl Küchler. Berlin: A. Schall, [1910]. Size 9½ × 6½, pp. xx. and 234. *Sketch-map and Illustrations. Price* 5*m.*

Italy. **Macmillan.**

Macmillan's Guides. Guide to Italy and Sicily. 6th edit. London: Macmillan & Co., 1911. Size 7 × 4½, pp. cxxviii., 394, and 4. *Maps and Plans. Price* 10*s. net. Presented by the Publishers.*

Spain. **Calvert.**

Catalonia and the Balearic Isles: an historical and descriptive account by Albert F. Calvert. ("The Spanish Series.") London: John Lane, 1910. Size 7½ × 5, pp. xvi. and 108. *Illustrations. Price* 3*s.* 6*d. net. Presented by the Publisher.*

Spain. **Chapman and Buck.**

Unexplored Spain. By Abel Chapman and Walter J. Buck. London: E. Arnold, 1910. Size 10½ × 7, pp. xvi. and 416. *Illustrations and Sketch-map. Price* 21*s. net. Presented by the Publisher.*

United Kingdom—England—Historical. **Berry.**

Lands and their stories. Book III. England and the English. By A. J. Berry. London: Blackie & Son, 1910. Size 8 × 5, pp. 200. *Sketch-maps and Illustrations. Price* 1*s.* 3*d. Presented by the Publishers.*

United Kingdom—Physical History. **Jukes-Browne.**

The building of the British Isles; being a history of the construction and geographical evolution of the British region. By A. J. Jukes-Browne. 3rd edit. London: E. Stanford, 1911. Size 8 × 5½, pp. xvi. and 470. *Maps, Illustrations, and Sections. Price* 18*s. net. Presented by the Publisher.*

United Kingdom—Place-names. **McClure.**

British place-names in their historical setting. By Edmund McClure. London: Society for Promoting Christian Knowledge, 1910. Size 8 × 5½, pp. 350. *Price* 5*s. Presented by the Publishers.*

United Kingdom—Scilly. **Mothersole.**

The Isles of Scilly: their story, their folk, and their flowers. Painted and described by Jessie Mothersole. London: The Religious Tract Society, [1910]. Size 9 × 7, pp. xii. and 244. *Sketch-map and Illustrations. Price* 10*s.* 6*d. net. Presented by the Publishers.*

United Kingdom—Scotland—Ayrshire. **Foster.**

Cambridge County Geographies: (Scotland, edited by W. Murison). Ayrshire. By John Foster. Cambridge: University Press, 1910. Size 7½ × 5, pp. x. and 176. *Maps, Illustrations, and Diagrams. Price* 1*s.* 6*d. Presented by the Publishers.*

United Kingdom—Surrey. **Smith.**

The Reigate sheet of the One-inch Ordnance Survey: a study in the geography of the Surrey Hills. By Ellen Smith. (Studies on Economic and Political Science. Edited by the Director of the London School of Economics and Political Science. No. 1 in the Series of Geographical Studies.) London: A. & C. Black, 1910. Size 9 × 5½, pp. xx. and 110. *Maps and Illustrations. Price* 3*s.* 6*d. net. Presented by the London School of Economics.*

ASIA.

Asia—Geology. **Launay.**

La géologie et les richesses minérales de l'Asie. Par L. de Launay. Paris: Ch. Béranger, 1911. Size 9½ × 6½, pp. 816. *Maps. Price* 28*s.*

The same author (who is professor at the École des Mines) brought out a similar work in reference to Africa some years ago (cf. *Journal*, vol. 21, p. 660).

Asia—Missions. **Ingham.**

From Japan to Jerusalem. By the Right Rev. E. Graham Ingham. London: Church Missionary Society, 1911 [1910]. Size 9 × 5½, pp. viii. and 232. *Illustrations. Price* 2*s.* 6*d. net. Presented by the Publishers.*

Central Asia. **Lyons.**

Afghanistan: the buffer state. Great Britain and Russia in Central Asia: a comprehensive treatise on the entire Central Asian question. By Capt. Gervais Lyons. (Published with the official sanction of the Army Council.) Madras (London: Luzac & Co.), 1910. Size 8½ × 5½, pp. viii., 232, and x. *Maps. Price* 7*s.* 6*d. Presented by the Publishers.*

Central Asia. **Tocugiro.**

Nisci Tocugiro. L'Asia Centrale: note di viaggio e studi di un diplomatico giapponese. Traduzione di L. Nocentini. Sotto gli auspici della Società Geografica Italiana. Turin: Unione Tipografico-Editrice Torinese, 1911 [1910]. Size 9½ × 6, pp. xx. and 318. *Map. Price* 4.50 *Lire. Presented by the Publishers.*

Central Asia—Lake Aral. **Barthold.**

Nachrichten über den Aral-See und den unteren Lauf des Amu-darja von den ältesten Zeiten bis zum xvii. Jahrhundert. Von Dr. W. Barthold. (Quellen und Forschungen zur Erd- und Kulturkunde, herausgegeben . . . durch Dr. R. Stübe, Band II.) Leipzig: O. Wigand, 1910. Size 10 × 7, pp. xvi. and 80. *Price* 5*m.* 40. *Presented by the Editor.*

Ceylon—Ethnology. **Parker.**

Village folk-tales of Ceylon. Vol. 1. Collected and translated by H. Parker. London: Luzac & Co., 1910. Size 9 × 5½, pp. viii. and 396. *Price* 12*s. net. Presented by the Publishers.*

China. **Hooker.**

Behind the scenes in Peking; being experiences during the siege of the Legations. By Mary Hooker. London: J. Murray, 1910. Size 8 × 5½, pp. viii. and 210. *Plan and Illustrations. Price* 7*s.* 6*d. net. Presented by the Publisher.*

China—Geology. *Z. Ges. E. Berlin* 1910: 504–511. **Frech.**

Ueber die geologische Entwickelung Chinas. Von Prof. Dr. Fritz Frech.

China—Historical. **Morse.**

The international relations of the Chinese Empire, the period of conflict, 1834–1860. By Hosea Ballou Morse. London: Longmans, Green & Co., 1910. Size 9 × 5½, pp. xl. and 728. *Maps, Plans, and Illustrations. Price* 26*s. net.*

A careful piece of work. The author is already known for his book on the administration of China.

China—Islam. **Broomhall.**

Islam in China: a neglected problem. By Marshall Broomhall. London: Morgan & Scott, 1910. Size 10 × 6, pp. xx. and 332. *Sketch-map and Illustrations. Price* 7*s.* 6*d. net. Presented by the China Inland Mission.*

China—Sechuan. *Petermanns M.* **56** (1910): 2 Halbbd. 67-71. **Weiss.**

Reise durch die Eingeborenenstaaten in Westszetschuan. Von — Weiss. *Map and Illustrations.*

Chinese Chronology. **Hoang.**

Variétés sinologiques, No. 29. Concordance des chronologies néoméniques chinoise et européenne. Par le Rév. Père P. Hoang. Shanghai: Imprimerie de la Mission Catholique . . . de T'ou-sè-wè, 1910. Size 9½ × 6½, pp. xvi. and 570. *Presented by the T'ou-sè-wè Press.*

Chinese Empire—Tibet. *Petermanns M.* **56** (1910): 2 Halbbd. 1-6. **Hedin.**

Die wissenschaftlichen Ergebnisse meiner Reise in Tibet, 1906-08. Von Dr. Sven v. Hedin. *Maps and Illustrations.*

Chinese Empire—Tibet. **Younghusband.**

India and Tibet: a history of the relations which have subsisted between the two countries from the time of Warren Hastings to 1910; with a particular account of the Mission to Lhasa of 1904. By Sir Francis Younghusband. London: John Murray, 1910. Size 9 × 6, pp. xvi. and 456. *Maps and Illustrations. Price* 21*s. net. Presented by the Publisher.*

See review in the January number, p. 83.

Eastern Asia. *C.R. IX^e Congrès Int. G.* **2** (1910): 201-213. **Rudolph.**

Die Beziehungen zwischen den tektonischen und seismischen Verhältnissen Ostasiens. Von Prof. Dr. E. Rudolph. *Map.*

Eastern Asia—Communications. *Petermanns M.* **56** (1910): [i.] 173-175. **Toepfer.**

Japanische Eisenbahnarbeiten und Hafenbauten auf dem Asiatischen Festland. Von Major Toepfer. *Map.*

French Indo-China—Tongking. **Dupuis.**

Jean Dupuis. Le Tonkin de 1872 à 1886: histoire et politique. Paris: A. Challamel, 1910. Size 9 × 5½, pp. 580. *Presented by the Author.*

M. Dupuis is the doyen of French explorers in Tongking.

India. **Mackinder.**

India: eight lectures prepared for the Visual Instruction Committee of the Colonial Office by H. J. Mackinder. London: G. Philip & Son, 1910. Size 7½ × 5, pp. x. and 146. *Sketch-maps and Illustrations. Price* 1*s. net. Presented by the Publishers.*

Eight lectures on India. By the same. [Lecturer's edition of preceding work.] London: Waterlow & Sons, 1910. Size 8 × 5, pp. x. and 130. *Price* 1*s. net. Presented by Messrs. G. Philip & Son.*

India—Bombay—Sind. **Aitken.**

Gazetteer of the province of Sind. ["A" volume.] Compiled by E. H. Aitken. Karachi, 1907. Size 10 × 6½, pp. [xviii.], 520, and xlii. *Map. Price* 22*s.* 6*d. Presented by the Secretary of State for India.*

India—Burma—Shans. **Milne and Cochrane.**

Shans at Home. By Mrs. Leslie Milne. With two chapters on Shan history and literature by the Rev. Wilbur Willis Cochrane. London: J. Murray, 1910. Size 9 × 5½, pp. xxiv. and 2901. *Sketch-map and Illustrations. Price* 15*s. net. Presented by the Publisher.*

India—Himalaya. **Jenkins.**

Sport and travel in both Tibets. By Lady [Minna] Jenkins. London: Blades, East and Blades, [1909]. Size 11 × 7½, pp. vi. and 88. *Map and Illustrations. Presented by the Publishers.*

India—Minerals. *Mem. Geol. Surv. India* **37** (1909): pp. xcviii. and 1294. **Fermor.**

The Manganese-Ore Deposits of India. By L. Leigh Fermor. *Maps, Diagrams, Plans, Sections, and Illustrations.*

India—North-West Frontier. **General Staff, Indian Army.**

A dictionary of the Pathan tribes on the north-west frontier of India. Prepared by the General Staff, Army Headquarters, India. Calcutta, 1910. Size 7 × 5, pp. ii., 262, and ii. *Presented by the Indian General Staff.*

India and Persia. **Stewart.**

Through Persia in disguise, with reminiscences of the Indian Mutiny. By Colonel Charles E. Stewart. Edited from his diaries by Basil Stewart. London: G.

Routledge & Sons, 1911 [1910]. Size 9 × 6, pp. xxiv. and 430. *Maps and Illustrations. Price* 15*s. net. Presented by the Publishers.*

Japan—Railways. [Imperial Railway Board.]

The railways of Japan. [Published by the Imperial Railway Board. Tokyo, 1910.] Size 10½ × 14½, pp. 72. *Map, Illustrations, and Diagrams. Presented.*

A general popular account of the Japanese railways and their history.

Malay Archipelago—Phytogeography. Haberlandt.

Botanische Tropenreise. Indo-Malayische Vegetationsbilder und Reiseskizzen. Von Prof. Dr. G. Haberlandt. 2 Auflage. Leipzig: W. Engelmann, 1910. Size 9½ × 6½, pp. viii. and 296. *Illustrations. Price* 11*s.* 9*d.*

Contains some striking studies of tropical plant-life.

Malay States. Harrison.

An illustrated guide to the Federated Malay States. Editor: Cuthbert Woodville Harrison. London: Malay States Development Agency, [1910]. Size 6½ × 4, pp. x. and 334. *Map and Illustrations. Price* 2*s.* 6*d. net. Presented by the Publishers.*

Persia. Hedin.

Overland to India. By Sven Hedin. 2 vols. London: Macmillan & Co., 1910. Size 9 × 6, pp. (vol. 1) xx. and 416; (vol. 2) xiv. and 358. *Map and Illustrations. Price* 30*s. net. Presented by the Author.*

See review, *ante*, p. 305.

Persia and Turkey. Fraser.

Persia and Turkey in revolt. By David Fraser. London, etc.: W. Blackwood & Sons, 1910. Size 9 × 5½, pp. xii. and 440. *Sketch-map and Illustrations. Price* 12*s.* 6*d. net. Presented by the Publishers.*

Turkey—Asia Minor—Archæology. Hasluck.

Cyzicus: being some account of the history and antiquities of that city, and of the district adjacent to it, with the towns of Appolonia ad Rhyndacum, Miletupolis, Hadrianutheræ, Priapus, Zeleia, etc. By F. W. Hasluck. Cambridge: University Press, 1910. Size 8½ × 5½, pp. xii. and 316. *Maps, Plans, and Illustrations. Price* 10*s. net. Presented by the Publishers.*

Turkey—Palestine. Thomson and Grande.

The Land and the Book; or Biblical illustrations drawn from the manners and customs, the scenes and scenery of the Holy Land. By Dr. W. M. Thomson. New edition, revised by Julian Grande. London: T. Nelson & Sons, 1910. Size 9 × 6½, pp. xvi. and 724. *Map and Illustrations. Price* 6*s. net. Presented by the Publishers.*

Turkey—Palestine—Dead Sea. Abel.

Etudes palestiniennes et orientales. Une croisière autour de la Mer Morte. Par le P. F.-M. Abel. Paris: V. Lecoffre, 1911. Size 10 × 6½, pp. iv. and 188. *Map and Illustrations. Price* 6*s.*

A valuable addition to our knowledge of the Dead Sea and its shores.

Turkey—Palestine and Syria. Macmillan.

Macmillan's Guides. Guide to Palestine and Syria. 5th edit. London: Macmillan & Co., 1910. Size 7 × 4½, pp. xxxii. and 164. *Maps and Plans. Price* 5*s. net. Presented by the Publishers.*

AFRICA.

Africa—Phytogeography. Engler.

Die Vegetation der Erde: Sammlung pflanzengeographischer Monographien, herausgegeben von A. Engler und O. Drude. IX. Die Pflanzenwelt Afrikas insbesondere seiner tropischen Gebiete. Grundzüge der Pflanzenverbreitung in Afrika und die Charakterpflanzen Afrikas. Von A. Engler. I. Band: Allgemeiner Ueberblick über die Pflanzenwelt Afrikas und ihre Existenzbedingungen. Hälfte i. und ii. Leipzig: W. Engelmann, 1910. Size 10 × 7, pp. xxviii. and 1030. *Maps and Illustrations. Price* 40*s.* 6*d.*

Africa—Zoology. Lankester and Ridewood.

Monograph of the Okapi. By Sir E. Ray Lankester. Atlas . . . compiled with the assistance of Dr. W. G. Ridewood. London: British Museum (Natural History), 1910. Size 12½ × 9½, pp. xxii. and 48. *Plates and Illustrations. Presented by the Trustees.*

This atlas was to have accompanied a complete monograph, but it is doubtful whether the text as originally planned will now be brought out.

Belgian Congo—Ethnology. **Baudhuin and others.**
B.S.R. Belge G. **33** (1909): 464–510; **34** (1910) 198–229.
Ethnographie Congolaise. Chez les Lessa d'après les renseignements fournis par M. Baudhuin. Par — Viaene et — Bernard.

British East Africa. **Bary.**
Maxime de Bary. Grand gibier et terres inconues: autour des Grands Lacs de l'Afrique centrale, le Mont Elgon. 2e édit. Paris: Plon-Nourrit et Cie., 1910. Size 9 × 6, pp. viii. and 342. *Map and Illustrations. Price* 10 *fr. Presented by the Publishers.*

British East Africa. **McCutcheon.**
In Africa: hunting adventures in the big-game country. By John T. McCutcheon. Indianapolis: The Bobbs-Merrill Co., 1910. Size 10 × 7, pp. x. and 402. *Illustrations and Sketch-maps. Presented by the Author.*

British East Africa—Ethnology. **Hobley.**
Ethnology of the A-Kamba and other East African tribes. By C. W. Hobley. Cambridge: University Press, 1910. Size 9 × 5½, pp. xvi. and 172. *Map and Illustrations. Price* 7*s.* 6*d. net. Presented by the Publishers.*

British East Africa—Game. **Tjader.**
The big game of Africa. By Richard Tjader. London, etc.: D. Appleton & Co., 1911. Size 9 × 6, pp. xx. and 364. *Sketch-map and Illustrations. Price* 12*s.* 6*d. net. Presented by the Publishers.*

Central Africa. *Z. Ges. E. Berlin* (1910): 392–395. **Eckardt.**
Ueber die botanisch-zoologischen Ergebnisse der zentral-afrikanischen Expedition des Herzogs Adolf Friedrich zu Mecklenburg in ihren Beziehungen zum Klima. Von Dr. Wilh. R. Eckardt.

Egypt. **Butcher.**
Egypt as we knew it. By E. L. Butcher. London: Mills & Boon, [1911]. Size 7½ × 5, pp. vi. and 228. *Illustrations. Price* 5*s. net. Presented by the Publishers.*

Egypt. **Fyfe.**
The new spirit in Egypt. By H. Hamilton Fyfe. Edinburgh and London: W. Blackwood & Sons, 1911. Size 7½ × 5, pp. viii. and 284. *Price* 5*s. net. Presented by the Publishers.*

Egypt—Archæology. **Maspero.**
Egypt: Ancient sites and modern scenes. By Sir Gaston Maspero. London: T. Fisher Unwin, 1910. Size 9 × 6, pp. 330. *Illustrations. Price* 12*s.* 6*d. net. Presented by the Publisher.*

Egypt—Nubia—Archæology. **Randall-MacIver and others.**
University of Pennsylvania: Egyptian Department of the University Museum. Eckley B. Coxe, Junior. Expedition to Nubia. Vol. **2**: Churches in lower Nubia. By Geoffrey S. Mileham, edited by D. Randall-MacIver (pp. xvi. and 58). Vols. **3–4**: Karanòg, the Roman-Nubian cemetery. By C. Leonard Woolley and D. Randall-MacIver. Text (pp. xii. and 286) and Plates. Philadelphia: University Museum, 1910. Size 11 × 8½. *Sketch-maps, Plans, and Illustrations. Presented by Eckley B. Coxe, Esq.*

Egypt and Sudan—Archæology. *P.S. Antiquaries* **23** (1910): 217–227. **Clarke.**
[Notes on the Christian antiquities of Egypt and the Sudan. By Somers Clarke.] *Plans.*

Egyptian Sudan. **Fothergill.**
Five Years in the Sudan. By Edward Fothergill. London: Hurst & Blackett, 1910. Size 9 × 5½, pp. xvi. and 328. *Illustrations. Price* 16*s. net.*
Though largely concerned with sport, this volume describes journeys in some little-known parts of the Egyptian Sudan and the north-east part of the Belgian Congo.

French West Africa. *J.R. Artillery* **37** (1910): 329–340. **Haywood.**
A Journey from Sierre Leone to Algeria across the Sahara. By Captain A. H. W. Haywood. *Sketch-map and Illustrations.*
A short account of this journey was given in vol. **36**, p. 358.

German East Africa—Karagwe. *Z. Ges. E. Berlin* (1910): 525–527. **Kirschstein.**
Die heissen Quellen von Mtagata in Karagwe. Von Egon Fr. Kirschstein.

German South-West Africa. *M. Deuts. Schutzgebieten* **23** (1910): 161–163. **Drews.**

Erkundung der Hunsberge. Von Leutnant Drews. *Map and Illustrations.*

These hills lie to the north of the lower Orange.

German South-West Africa. **Streitwolf.**

Der Caprivizipfel. Von Hauptmann Streitwolf. Berlin: W. Süsserott, 1911. Size 8½ × 5½, pp. 236. *Sketch-map and Illustrations. Price* 4*m. Presented by the Publishers.*

On the north-eastern extension of German South-West Africa.

Morocco. **Artbauer.**

Kreuz und Quer durch Marokko: Kultur- und Sittenbilder aus dem Sultanat des Westens. Von Otto C. Artbauer. Stuttgart: Strecker und Schröder, 1911. Size 8½ × 6, pp. x. and 234. *Map and Illustrations. Price* 4*s.*

The author, whose new expedition to North Central Africa has been lately referred to in the *Journal* (vol. **36**, p. 733; vol. **37**, p. 95), has for some years devoted himself to research in the Mohammedan countries of Asia and Africa.

Nigeria—Tin. **Calvert.**

Nigeria and its tin-fields. By Albert F. Calvert. London: E. Stanford, 1910. Size 7½ × 5, pp. xvi. and 188. *Sketch-maps and Illustrations. Price* 3*s.* 6*d. Presented by the Publisher.*

North Africa. **Shoemaker.**

Islam lands: Nubia, the Sudan, Tunisia, and Algeria. By Michael Myers Shoemaker. New York and London: G. P. Putnam's Sons, 1910. Size 8½ × 5½, pp. xii. and 252. *Plan and Illustrations. Price* 10*s.* 6*d. net. Presented by the Publishers.*

Sahara. **Gautier.**

E. F. Gautier. La conquête du Sahara: essai de psychologie politique. Paris: A. Colin, 1910. Size 7½ × 5, pp. 262. *Price* 3.50 *fr. Presented by the Publisher.*

Sierra Leone. **Lukach.**

A bibliography of Sierra Leone, with an introductory essay on the origin, character, and peoples of the Colony. By Harry Charles Lukach. Oxford: Clarendon Press, 1910. Size 9½ × 6, pp. 144. *Sketch-map. Price* 8*s.* 6*d. net. Presented by the Publishers.*

This seems to be fairly complete, at least as regards literature in English. The arrangement is not altogether satisfactory, the subdivision into sections, chiefly according to classes of publications, seeming unnecessary. In quoting from the Society's publications no distinction is made between the *Journal* and *Proceedings*.

South Africa. **Brown.**

The guide to South Africa, for the use of tourists, sportsmen, invalids, and settlers. Edited annually by A. Samler Brown and G. Gordon Brown for the Union-Castle Mail Steamship Company, Ltd., 1910–11. (18th) edition. London: S. Low & Co., [1910]. Size 7½ × 5, pp. xliv. and 492. *Maps, Plans, and Diagrams. Price* 5*s.* 6*d. Presented by the Union-Castle Mail S.S. Co.*

South Africa. **Southey and Slaughter.**

Storm and sunshine in South Africa. By Rosamond Southey; edited by Frances Slaughter. London: J. Murray, 1910. Size 9 × 5½, pp. xii. and 378. *Illustrations. Price* 6*s. net. Presented by the Publisher.*

South Central Africa. **Schomburgk.**

Wild und Wilde im Herzen Afrikas. Zwölf Jahre Jagd- und Forschungsreisen. Von Hans Schomburgk. Berlin: E. Fleischel & Co., 1910. Size 9½ × 6½, pp. xvi. and 374. *Map and Illustrations. Price* 8*s.*

The author was a good deal off the beaten track, *e.g.* in the region about the source of the Zambezi.

Sudan. **Kumm.**

From Hausaland to Egypt through the Sudan. By Dr. H. Karl W. Kumm. London: Constable & Co., 1910. Size 9½ × 6½, pp. xiv. and 324. *Maps and Illustrations. Price* 16*s. net. Presented by the Publishers.*

Sudan—Missions. **Kumm.**

Khont-hon-nofer: the lands of Ethiopia. By Dr. H. K. W. Kumm. London: Marshall Bros., 1910. Size 9 × 6, pp. xii. and 292. *Map and Illustrations. Price* 6*s. net. Presented by the Publishers.*

NORTH AMERICA.

America. **Webb.**

A Systematic Geography of America. By George William Webb. London: Methuen & Co., 1911. Size 7½ × 5, pp. viii. and 108. *Sketch-maps and Sections. Price* 1*s. Presented by the Publishers.*

America—Historical. *T. and P.G.S. Pacific*, Ser. II. 6 (1910): 51–81. **Niebaum.**

The Discoveries of the Norsemen on the North-east Coast of America. Their attempt at colonization. By Gustave Niebaum.

America—Slings. *Globus* **98** (1910): 287–290. **Friederici.**

Die Verbreitung der Steinschleuder in Amerika. Von Dr. Georg Friederici.

Canada. *B.S.Q. Quebec* **4** (1910): 157–180. **[Rouillard.]**

L'Ouest canadien. Provinces du Manitoba, Saskatchewan et d'Alberta. Par E[ugène] R[ouillard].

Canada. **Yeigh.**

Through the Heart of Canada. By Frank Yeigh. London: T. Fisher Unwin, 1910. Size 9 × 6, pp. 320. *Illustrations. Price* 10*s.* 6*d. net. Presented by the Publisher.*

Canada—Mount Robson. *Canadian Alpine J.* **2** (1910): No. II. 108–113. **Coleman.**

Geology and Glacial Features of Mount Robson. By A. P. Coleman. *Sketch-map and Illustrations.*

Canada—Mount Robson. **Kinney and Phillips.**

Canadian Alpine J. **2** (1910): No. II. 21–44.

To the Top of Mount Robson. By G. B. Kinney and Donald Phillips. *Illustrations.*

This first ascent was achieved on August 13, 1909.

Canada—Mount Robson. *Canadian Alpine J.* **2** (1910): No. II. 1–20. **Mumm.**

An expedition to Mount Robson. By A. L. Mumm. *Illustrations.*

Describes an attempted ascent in August and September, 1909.

Canada—St. Lawrence. **White.**

Place-names in the Thousand islands, St. Lawrence River. By James White. Ottawa, 1910. Size 9½ × 6½, pp. 8. *Presented by the Author.*

Explains the origin of the names, many of which are those of British Officers who distinguished themselves in the war of 1812–14.

Mexico—Archæology. **Rickards.**

The Ruins of Mexico. By Constantine George Rickards. Vol. 1. London: H. E. Shrimpton, 1910. Size 13½ × 9½, pp. viii. and 154. *Illustrations. Price* 42*s. net. Presented by Francis V. Lister, Esq.*

United States—Wisconsin. **Fenneman.**

On the lakes of South-Eastern Wisconsin. By Dr. N. M. Fenneman. Second edition. (Wisconsin Geological and Natural History Survey, Bulletin No. 8.) Madison, Wis., 1910. Size 9½ × 6, pp. xiv. and 188. *Maps, Illustrations, and Sections. Presented by the Author.*

CENTRAL AND SOUTH AMERICA.

Argentine. **Martinez and Lewandowski.**

The Argentine in the Twentieth Century. By Albert B. Martinez and Maurice Lewandowski. Translated from the third French edition. London: T. Fisher Unwin, 1911. Size 9 × 6, pp. 376. *Map. Price* 12*s.* 6*d. net. Presented by the Publisher.*

Argentine. **Pennington.**

The Argentine republic: its physical features, history, fauna, flora, geology, literature, and commerce. By A. Stuart Pennington. London: S. Paul & Co., [1910]. *Map and Illustrations. Price* 10*s.* 6*d. net. Presented by the Publishers.*

Brazil. **Walle.**

Paul Walle. Au Brésil: du Rio São Francisco à l'Amazone. Paris: E. Guilmoto, 1910. Size 9 × 5½, pp. 464. *Maps and Illustrations. Price* 10 *fr. Presented by the Publisher.*

Brazil—Matto Grosso. *Petermanns M.* **56** (1910): [i.] 260–261. **Rondon.**

Col. Candido Rondons Expedition im brasilischen Hinterlande. *Map.*

Some account of this expedition was given in vol. **31**, p. 568.

British Guiana—Historical. **Storm van 's Gravesande.**

[Laurens] Storm van 's Gravesande. The rise of British Guiana. Compiled from his despatches by C. A. Harris and J. A. J. de Villiers. 2 vols. (Works issued by the Hakluyt Society; Second Series, Nos. 26–27.) London, 1911. Size 9 × 6, pp. viii. and 704. *Maps, Plan, and Illustrations.*

A valuable addition to the publications of the Hakluyt Society, edited with care and judgment.

Chile—Andes. *B.I.G. Argentino* **23** (N.D.): 200–206. **Kühn.**

El Camino Trasandino sobre el Boquete de Pérez Rosales. Por Dr. Franz Kühn. *Map.*

Chile—Patagonia. **Steffen.**

Viajes de exploracion i estudio en la Patagonia occidental, 1892–1902. Por el Dr. Hans Steffen. 2 vols. Santiago: Imprenta Cervantes, 1909–10. Size 10 × 7, pp. (vol. 1) xii. and 410; (vol. 2) viii. and 550. *Maps and Illustrations. Presented by the Author.*

Ecuador—Archæology. **Saville.**

Contributions to South American Archæology: the George G. Heye expedition. (Vol. 2). The antiquities of Manabi, Ecuador: final report. By Marshall H. Saville. New York, 1910. Size 13 × 9½, pp. (xiv.) and 284. *Map and Illustrations. Presented by the Author and George G. Heye, Esq.*

Guatemala. **Castañeda.**

Francisco Castañeda. The traveller's guide in the Republic of Guatemala. Spanish and English edition. Guatemala, 1909. Size 7 × 10½, pp. vi. and 272. *Map and Illustrations. Price* $2 (*Guatemalan*). *Presented by the Author.*

Paraguay—Historical. **Labrador.**

J. José Sánchez Labrador. El Paraguay católico. 2 vols. Edited from the MS. of 1770 by Samuel A. Lafone Quevedo. Buenos Ayres, 1910. Size 11 × 7½, pp. (vol. 1) xx. and 324; (vol. 2) 332. *Facsimile Maps and Illustrations. Presented by the Museo de La Plata.*

Paraguay—Phytogeography. **Chodat and Hassler.**

C.R. XI^e Congrès Int. G. **2** (1910): 504–536.

Aperçu de la géographie botanique du Paraguay. Par Prof. Dr. R. Chodat et Dr. E. Hassler.

Peru. *B.G.S. Philadelphia* **8** (1910): (79)–(97), (153)–(171). **Wilson.**

Climate and Man in Peru. By Dr. Lucy L. W. Wilson. *Diagrams.*

Peru—Historical. **Arriaga.**

Extirpacion de la idolatria del Piru. Dirigido al Rey N.S. en su Real Consejo de Indias. Por el Padre Pablo Joseph de Arriaga de la Campañia de Jesus. En Lima; Por Geronymo de Contreras, Impressor de Libros. Con Licencia. Año 1621 [Facsimile reprint; Buenos Aires, 1910]. Size 9 × 6½, pp. 6, [xvi.], and 144. *Presented by Señor S. A. Lafone Quevedo.*

Peru—Historical. **Pietschmann.**

Bericht des Diego Rodriguez de Figueroa über seine Verhandlungen mit dem Inka Titu Cusi Yupanqui in den Anden von Villcapampa. Mitgeteilt von Richard Pietschmann. (Aus den Nachrichten der k. Gesellschaft der Wissenschaften zu Göttingen; Philologisch-historische Klasse, 1910.) [Göttingen, 1910.] Size 9½ × 6½, pp. 79–122.

South America—Chaco. **Nordenskiöld.**

Indianlif i El Gran Chaco (Syd-Amerika). Af Erland Nordenskiöld. Stockholm: A. Bonnier, 1910. Size 9½ × 6½, pp. 320. *Sketch-maps and Illustrations. Presented by the Author.*

West Indies—Cuba. **Wright.**

Cuba. By Irene A. Wright. New York (London, Macmillan & Co.), 1910. Size 8 × 5½, pp. xiv. and 512. *Sketch-map and Illustrations. Price* 10*s.* 6*d. net. Presented by the Publishers.*

West Indies—Jamaica. **Wreford.**

Wanderings in Jamaica. By the Rev. Godfrey Reynell Wreford. Bath [Privately printed], 1910. Size 8½ × 5, pp. 24. *Illustrations. Presented by the Author.*

AUSTRALASIA AND PACIFIC ISLANDS.

Fiji. **Burton.**

The Fiji of to-day. By John Wear Burton. London: C. H. Kelly, 1910. Size 8½ × 5½, pp. 364. *Illustrations. Price 7s. 6d. net. Presented by the Publisher.*

New Guinea—Dutch.

Ts. k. Nederl. Aardr. Genoots. 2 Ser. **27** (1910): 1011–1026.

De Eilanden-rivier op Nieuw-Guinea. *Map.*

The map shows the results of recent exploration in various parts of Dutch New Guinea. (A reconaissance of the Utakwa river is described on pp. 1040–1042).

New Guinea—German. *Petermanns M.* **56** (1910): 2 Halbbd. 182–186. **Friederici.**

In das Hinterland der Nordküste des Kaiser Wilhelmlandes (Neuguinea). Von Hauptm. a. D. Dr. G. Friederici. *Maps.*

New Guinea—German. *Petermanns M.* **56** (1910): [i.] 78–80, 132–135. **Reiber and Richarz.**

Eine geologische Expedition in das Toricelli-Gebirge (Kaiser-Wilhelms-Land). Von P. Jos. Reiber, bearbeitet von P. Steph. Richarz. *Map.*

New Guinea—German. *Petermanns M.* **56** (1910): [i.] 189–193, 255–256. **Sapper**

Beiträge zur Kenntnis Neupommerns und des Kaiser-Wilhelms-Landes. Nach den Aufnahmen von Hauptm. a. D. Dr. G. Friederici, nach Aufzeichnungen von Assessor Full und eigenen Beobachtungen. Von Prof. Dr. Karl Sapper. *Maps.*

New Hebrides—Quiros' description. **Macdonald.**

Victorian G.J. **26–27** (1908–9): 98–108.

The Physical features, etc., of the New Hebrides group in 1908 compared with de Quiros' description in 1606. By A. C. Macdonald.

New South Wales—Geology. **Harper.**

Records Geol. Surv. New South Wales **9** (1909): 1–54.

The Geology of the Murrumbidgee River District, near Yass. By L. F. Harper. *Maps, Plans, Sections, and Illustrations.*

Papua. **Grimshaw.**

The new New Guinea. By Beatrice Grimshaw. London: Hutchinson & Co., 1910. Size 9 × 5½, pp. viii. and 322. *Map and Illustrations. Price 12s. 6d. net.*

POLAR REGIONS.

Antarctic—French Expedition. **Charcot.**

Dr. Jean Charcot. Le *Pourquoi Pas?* dans l'Antarctique. Journal de la deuxième expédition au Pole Sud, 1908–1910; suivi des rapports scientifiques des membres de l'Etat Major. Paris: E. Flammarion, 1910. Size 11 × 7½, pp. viii. and 428. *Maps and Illustrations. Price 15 fr. Presented by the Author.*

See reviews, *ante*, p. 310.

Arctic—Exploration. **Edwards.**

The toll of the Arctic Seas. By Deltus M. Edwards. New York: H. Holt & Co. (London: Chapman & Hall), 1910. Size 8½ × 5½, pp. x. and 450. *Maps, Portraits, and Illustrations. Price* $2.50 *net. Presented by the Publishers.*

Arctic—Exploration. **Wright.**

The great white North: the story of Polar exploration from the earliest times to the discovery of the Pole. By Helen S. Wright. New York (London: Macmillan & Co.), 1910. Size 7½ × 5½, pp. xviii. and 490. *Sketch-maps and Illustrations. Price 10s. 6d. net. Presented by the Publishers.*

Novaya Zemlya. **Snellen and Ekama.**

Rapport sur l'Expédition Polaire Néerlandaise qui a hiverné dans la Mer de Kara en 1882–83. Commencé par M. Snellen et fini par H. Ekama. Utrecht: J. van Boekhoven, 1910. Size 12 × 9½, pp. [x.], 142, and cviii. *Maps, Illustrations, and Diagrams. Presented by the K. Nederlandsch Meteorologisch Instituut.*

MATHEMATICAL GEOGRAPHY.

Instrument. **Monro.**

Notes on the use of the portable reversible Transit Instrument and the method of calculation of the observations. By Captain C. E. Monro. London: J. D. Potter, 1911. Size 8 × 5, pp. 60. *Illustrations and Diagrams. Price 3s. Presented by the Publisher.*

Kumatology. **Cornish.**

Waves of the sea and other water waves. By Vaughan Cornish. London: T. Fisher Unwin, 1910. Size 9 × 5½, pp. 374. *Sketch-maps, Illustrations, and Diagrams. Price 10s. net. Presented by the Publisher.*

Longitude determinations. *La G., B.S.G. Paris* **21** (1910): 34–37. **Tilho.**

Sur la précision des déterminations de longitude à terre, par le transport du temps, à l'aide des montres de torpilleur. (Mission Niger-Tchad.) Par Jean Tilho.

Photographic surveying. **Scheimpflug.**

Die technischen und wirtschaftlichen Chancen einer ausgedehnten Kolonial-Vermessung. Auszug aus dem Vortrag von Hauptmann Scheimpflug, gehalten am 14. August im Physikalischen Verein, Frankfurt a.M. (Sonderabdruck aus No. 11 der *Ila-Wochen-Rundschau.*) *Presented by Dr. K. Peucker.*

On the possibility of rapid photographic surveys from balloons.

Photographic surveying. **Scheimpflug.**

Der Photoperspectograph und seine Anwendung. Von Theodor Scheimpflug. (Separatabdruck aus der *Photographischen Korrespondenz*, November, 1906.) *Presented by Dr. K. Peucker.*

Physical geography. **Meunier.**

L'évolution des théories géologiques. Par Stanislas Meunier. Paris: F. Alcan, 1911. Size 7½ × 5, pp. 368. *Price 3 fr. 50.*

A handy summary of recent discussions and theories on the Earth and its surface features from a genetic point of view.

Position-determination. *Ann. Hydrographie* **37** (1909): 449–459. **Kohlschütter.**

Einheitliche Methoden für die astronomische Ortsbestimmung im Ballon. Von Dr. E. Kohlschütter.

Zoogeography—Mosquitoes. **Theobald.**

A monograph of the Culicidæ, or mosquitoes. Mainly compiled from collections received at the British Museum by Fred V. Theobald. Vol. 5. London: British Museum (Natural History), 1910. Size 8½ × 5½, pp. xvi. and 646. *Illustrations. Presented by the Trustees.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Geomorphology. *C.R. IX^e Congrès Int. G.* **2** (1910): 149–160. **Brounow.**

Ueber die Abhängigkeit einiger geographischen Elemente von dem barischen Relief der Erdoberflache. Von Prof. P. Brounow.

Geomorphology. *Jb. Schweizer Alpenclub* **45**, 1909–10 (1910): 225–249. **Ludwig.**

Flussgeröll, Molasseproblem und Alpenfaltung. Von A. Ludwig.

Geomorphology. *Univ. California Publ., B. Dept. Geology* **5** (1910): 413–420. **Knopf.**

The Probable Tertiary Land connection between Asia and North America. By Adolph Knopf.

Geomorphology—Coasts. **Braun.**

Ueber Küsten und ihre Entwicklung. Von Dr. G. Braun. (Sonderabdruck *Aus der Natur*, Leipzig, Jahrg. 1909.) Size 10 × 6½, pp. 12. *Diagrams.*

Geomorphology—Mountains. *C.R. IX^e Congrès Int. G.* **2** (1910): 119–124. **Romer.**

Das Vorherrschen der Talfragmente in der Morphologie der Gebirgsrücken. Von Prof. Dr. Eug. Romer.

Geophysics. *Beiträge Geophysik* **10** (1909): 202–264. **Arldt.**

Die Simrothsche Pendulationstheorie. Von Dr. Th. Arldt.

Geophysics. *M. k.k. G. Ges. Wien* **53** (1910): 251–266. **Helmhacker.**

Die Erddichte und der freie Fall ins Erdinnere. Von Emil Kraft von Helmhacker. *Diagrams.*

Glacier ice. *C.R. IXe Congrès Int. G.* **2** (1910): 353–359. **Hamberg.**
Ueber die Parallelstruktur des Gletschereises. Von Prof. Dr. Axel Hamberg. *Illustrations.*

Glacier streams. *C.R. IXe Congrès Int. G.* **2** (1910): 335–347. **Greim.**
Beiträge zur Thermik und zum Wasserhaushalt der Gletscherbäche. Von Dr. G. Greim. *Diagrams.*

Glaciers—Structure. *Geol. Mag.* V. **7** (1910): 433–436. **Deeley.**
The Structure of Glaciers. By R. M. Deeley.

Glaciers and Avalanches. *Z. Deuts. u. Osterr. Alpenv.* **39** (1908): 65–79. **Frech.**
Lawinen und Gletscher in ihren gegenseitigen Beziehungen. Von Prof. Dr. F. Frech. *Sketch-maps, Illustrations, and Diagram.*

Lakes and climatology. *Naturw. Wochenschrift* **8** (1909): 385–393. **Halbfass.**
Temperaturmessungen in tiefen Seen in ihrer Beziehung zur Klimatologie. Von Prof. Dr. Halbfass. *Also separate copy.*

Meteorology—Atmospheric physics. **Myrbach-Rheinfeld.**
Sitzb. K.A.W. Wien, IIa. Abt. **119** (1910): 419–435.
Ueber die Abhängigkeit des Transmissionskoeffizienten der Atmosphäre für die Sonnenstrahlung von Feuchtigkeit, Luftdruck und Wetterlage in Innsbruck. Von Dr. Otto Freihern von Myrbach-Rheinfeld. *Diagrams.*

Meteorology—Instruments. *Sc. P.R. Dublin S.* **12** (1910): 444–445. **Barrett.**
A simple form of open-scale isothermal air barometer. By W. F. Barrett.

Meteorology—Precipitation. *Meteor. Z.* **37** (1910): 307–313. **Kerner.**
Versuch einer indirekten Schätzung des Gesamtniederschlages auf der Nordhalbkugel. Von Dr. Fritz v. Kerner.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Civilization. **Mosso.**
The dawn of Mediterranean civilisation. By Angelo Mosso. London: T. Fisher Unwin, 1910. Size 10 × 6½, pp. xxiv. and 424. *Illustrations. Price* 16*s. net. Presented by the Publisher.*

Commercial Geography—Text-book. **Robinson.**
Commercial geography. By Edward van Dyke Robinson. New York, etc.: Rand, McNally & Co., [1910]. Size 8 × 6, pp. 456 and xlviii. *Maps, Illustrations, and Diagrams. Presented by the Publishers.*

Historical—Da Vinci. **Calvi.**
Introduzione al codice de Leonardo da Vinci della Biblioteca di Lord Leicester in Holkham Hall. Pubblicato sotto gli auspici del R. Istituto Lombardo di Scienze e Lettere da Gerolamo Calvi. Milan: L. F. Cogliati, 1909. Size 19½ × 13, pp. xxiv. *Facsimiles. Presented by the Author.*

The introduction only to the reproduction of this important MS., which deals with hydraulics and cosmography (cf. *Journal*, vol. **33**, p. 553).

Historical—La Pérouse. *Victorian G.J.* **26–27** (1908–9): 14–18. **Macdonald.**
The fate of La Pèrouse. By A. C. Macdonald.

In the writer's opinion the evidence is conclusive that a wreck found in 1861 on the Queensland coast is or was the craft built on Vanikoro by the survivors of La Pérouse's expedition. The nature of the evidence is not, however, stated.

Historical—Navigation. *B.G. Hist. et Descriptive* 1909 (1910): 346–377. **Anthiaume.**
L'Astrolabe "dit" de Béthencourt et la Science Nautique des Normands au Moyen âge. Par l'Abbé A. Anthiaume. *Illustrations.*

Historical—Portuguese Discoveries. **Jayne.**
Vasco da Gama and his successors, 1460–1580. By K. G. Jayne. London: Methuen & Co., [1910]. Size 9 × 5½, pp. xx. and 326. *Maps and Illustrations. Price* 10*s.* 6*d. net.*

An attempt to bring out the part played by the early Portuguese navigators in relation to the general history of their times.

Islam. **Chatelier.**
Politique musulmane: lettre à un Conseiller d'État. Par A. Le Chatelier. (*Revue du monde musulman*, Septembre 1910.) Paris: E. Leroux, 1910. Size

10 × 6½, pp. iv. and 166. *Sketch-maps and Illustrations. Presented by the Publisher.*

Medical Geography—Mountain sickness. **Thomas.**

Jb. Schweizer Alpenclub **45**, 1909–10 (1910): 205–224.

Le Mal de Montagne. Etude critique par Dr. Thomas.

BIOGRAPHY.

Petermann. **Weller.**

August Petermann. Ein Beitrag zur Geschichte der geographischen Entdeckungen und der Kartographie im 19. Jahrhundert. Von Dr. E. Weller. (Quellen und Forschungen zur Erd- und Kulturkunde. Herausgegeben . . . durch Dr. R. Stübe. Bd. IV.) Leipzig: O. Wigand, 1911. Size 10 × 7, pp. x. and 284. *Price* 12*m. Presented by the Editor.*

Rhodes. **Michell.**

The life of the Rt. Hon. Cecil John Rhodes, 1853–1902. By the Hon. Sir Lewis Michell, 2 vols. London: E. Arnold, 1910. Size 9 × 6, pp. (vol. 1) xvi. and 342; (vol. 2) xii. and 342. *Portraits and Illustrations. Price* 30*s. net.*

GENERAL.

Bibliography. **[Tweney.]**

Standard books: An annotated and classified guide to the best books in all departments of literature, with a copious index of subjects and biographical notes of authors. [General editor: C. F. Tweney.] Vol. 1: [General works: History, Biography, Geography, Travel, and Sport; Sociology; Law and Administration; Education; Philosophy]. London, etc.: T. Nelson & Sons, [1910]. Size 10½ × 7½, pp. 788 [loose-leaf binding; further pages to be added from time to time]. *Index-maps. Price* (*subscription to complete four vols.*), 63*s.*

Bibliography—Catalogue. **British Museum (Natural History).**

Catalogue of the books, manuscripts, maps, and drawings in the British Museum (Natural History). Vol. 3: L-O. London: British Museum, 1910. Size 11½ × 8½, pp. 1039–1494. *Presented by the Trustees.*

British Empire. **Bruce.**

The broad stone of Empire. Problems of Crown Colony administration, with records of personal experience. By Sir Charles Bruce. 2 vols. London: Macmillan & Co., 1910. Size 9 × 5½, pp. (vol. 1) xxxiv. and 512; (vol. 2) viii. and 556. *Maps and Portrait. Price* 30*s. net. Presented by the Publishers.*

Hints to Travellers. **Bongard.**

Wie wandere ich nach Deutschen Kolonien aus? Ratgeber für Auswanderungslustige von Dr. Oscar Bongard. 3 Auflage. Berlin: W. Süsserott, [1910]. Size 8½ × 5½, pp. 674. *Illustrations. Price* 60 *Pfg. Presented by the Publisher.*

Contains practical hints based on personal experience, which should be of service to those intending to visit or settle in the German colonies, particularly in Africa.

Levant. **Fawthrop.**

In lands of art and Holy Writ. By T. W. Fawthrop. London: Methodist Publishing House, [1911]. Size 8 × 5, pp. 320. *Illustrations. Price* 3*s.* 6*d. net. Presented by the Publishers.*

Spain and Morocco. **Zurano.**

Consideraciones comerciales sobre España y Marruecos. Por Emilio Zurano Muñoz. Madrid, 1910. Size 7½ × 5, pp. 148. *Maps. Presented by the Author.*

Text-book. **L'Estrange.**

Teachers' Handbook and Key to a Progressive course of comparative geography and Junior course of comparative geography, consisting of notes on method and answers to the questions and exercises, with an Introduction on the teaching of geography. By P. H. L'Estrange. London: G. Philip & Son, 1910. Size 7½ × 5, pp. 252, *Price* 5*s. net. Presented by the Publishers.*

Text-book. **Smith.**

Physical geography for schools. By Bernard Smith. London: A. & C. Black, 1910. Size 8½ × 5½, pp. viii. and 190. *Sketch-maps, Illustrations, and Diagrams. Price* 3*s.* 6*d. Presented by the Publishers.*

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

Belgium. **Institut Cartographique Militaire.**

Carte de Belgique. Scale 1 : 100,000 or 1 inch to 1·6 stat. mile. Sheet: IV. Anvers; V. Turnhout; VI. Maeseyck; XI. Hasselt; XII. Tongres. Brussels: Institut Cartographique Militaire, 1910.

British Isles—England. **Feigerl.**

Contour Relief Models of Eastern Kent, Oxford district, and Southern Hampshire with the Isle of Wight. Prepared from the Ordnance Survey by G. R. C. Feigerl. Horizontal scale 1 : 126,720 or 1 inch to 2 stat. miles, vertical scale 1 : 21,120 or 3 inches to 1 stat. mile. London: Sifton, Praed & Co., [1911]. *Price* £2 5*s. each.*

These three contour relief models complete the series for south-east England, which, with the three previously published, include the whole of the country from Cheltenham to the Kentish coast, and from Buckingham to the Isle of Wight. They consist of the colour-tinted contoured Ordnance Survey maps on the scale of 1 inch to 2 miles, mounted upon raised models, of which the vertical scale is six times the horizontal. As a whole they are certainly satisfactory, although less exaggeration of the vertical scale might have been an advantage. However, they are the best attempts at anything of the kind in this country, and are decidedly instructive.

British Isles—England and Wales. **Ordnance Survey.**

Sheets published by the Director-General of the Ordnance Survey, Southampton, from January 1 to 31, 1911.

1-inch (third edition). Outline:—

England. Sheets, 210, 211, 226, 227, 348. Engraved. *Price* 1*s. each.*

Ditto, 4th edition. Outline, 273. *Price* 1*s.*

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(*E. Stanford, London Agent.*)

Europe. **K. Preuss. Landesaufnahme.**

Uebersichtskarte von Mitteleuropa. Herausgegeben von der Kartogr. Abteilung der Kgl. Preuss. Landesaufnahme. Scale 1 : 300,000 or 1 inch to 4·7 stat. miles. Sheet: Strassburg. Berlin: R. Eisenschmidt, 1910. *Price* 1.50*m. each sheet.*

Faeroe islands. **Generalstabens Topografiske Afdeling, Copenhagen.**

Kort over Færgerne. Scale 1 : 20,000 or 3·2 inches to 1 stat. mile. 75 sheets:—Thorshavn med omliggende Trœr. Scale 1 : 5000 or 12·6 inches to 1 stat. mile. Copenhagen: Generalstabens Topografiske Afdeling. *Presented by the Chief of the Danish General Staff.*

This Danish Government survey map of the Faeroe islands consists of 75 sheets. Contour lines are in brown, at intervals of 5 and 10 metres, while heights of special points are given in figures. The sheets are most complete as regards detailed information, and the physical characteristics of the surface conditions are indicated by carefully selected contours and symbols. All trigonometrical stations are marked, and full explanation is given of the symbols employed. As a specimen of cartography this map leaves little to be desired.

France. **Service Géographique de l'Armée, Paris.**

Carte de France. Scale 1 : 50,000 or 1·3 inch to 1 stat. mile. Sheets: xxxv.-17, Rambervillers; xxxvi.-21, Belfort; xxxvi.-22 Delle. Paris: Service Géographique de l'Armée, 1910. *Price* 1.50 *fr. each sheet.*

Iceland. **Generalstabens Topografiske Afdeling, Copenhagen.**

Generalstabens Topografiske Kort over Island. Scale 1 : 50,000 or 1·3 inch to 1 stat. mile. Sheets:—17 N.A. utskálar; 17 S.A. Hvalsnes; 18 N.A. Reykjanes; 26 S.A. Akranes; 27 N.V. og S.V. Keflavík; 27 N.A. Reykjavík; 27 S.A. Hafnarfjördur; 28 N.V. Grindavík; 28 N.A. Herdisarvík; 36 S.V. Kjós; 36 S.A.

Armannsfell; 37 N.V. Mosfellsheiði; 37 N.A. Þingvallavatn; 37 S.V. Vífilsfell; 37 S.A. Ingólfsfjall; 38 N.V. Þorlákshöfn; 38 N.A. Loptsstaðir; 46 S.V. Skjaldbreið; 46 S.A. Geysir; 47 N.V. Biskupstungur; 47 N.A. Hreppar; 47 S.V. Hestfjall; 47 S.A. Storinupur; 48 N.V. Þykkvibær; 48 N.A. Þríhnyrningur; 48 S.V. Sigluvík; 48 S.A. Seljaland; 49 N.A. Vestmannaeyjar; 57 S.V. Hekla; 58 N.V. Tindfjallajökull; 58 S.V. Eyjafjallajökull; 59 N.V. Eyvindarhólar.—Þingvellir. Scale 1 : 5000 or 12·6 inches to 1 stat. mile. Copenhagen: Generalstabens Topografiske Afdeling, 1910. *Presented by the Chief of the Danish General Staff.*

These are additional sheets of the Government Survey of Iceland that have been issued on the scale of 1 : 50,000 since 1906, the first sheets being noticed in the *Geographical Journal* for June of that year. The map will be published on two scales, 1 : 50,000 and 1 : 100,000; the latter comprising 115 sheets, while on the former scale each of these sheets is divided into four quarters. Special plans of towns will be published on larger scales. Altogether 55 sheets on the 1 : 50,000 scale have appeared, and these include the whole of the southern coast and adjacent country. The style in which the map is produced is excellent. Heights are shown by contour lines in brown at 20-metre intervals, while by means of different colours and symbols it is easy to ascertain at a glance the character of any particular area.

Turkey. **Geographical Section, General Staff.**

Map of Turkey. Compiled in the Geographical Section, General Staff, War Office. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. Sheet: Kirjali. London: E. Stanford; Sifton, Praed & Co.; T. Fisher Unwin, 1910. *Price 2s. 6d. net each sheet.*

ASIA.

Java. **Topographical Bureau, The Hague.**

Topographische Kaart der Residentie Rembang. Scale 1 : 100,000 or 1 inch to 1·6 stat. mile. 4 sheets. The Hague: Topographical Bureau, 1910.

Malay Peninsula. **Stanford.**

The *Financial News* map of the Estates of Rubber Plantation Companies in the Malay Peninsula. Compiled from details officially supplied. Scale 1 : 1,000,000 or 1 inch to 15·8 stat. miles. London: Edward Stanford, 1910.

AFRICA.

Algeria. **Service Géografique de l'Armée, Paris.**

Carte de l'Algerie. Scale 1 : 50,000 or 1·3 inch to 1 stat. mile. Sheet 118, Navarin. Paris: Service Géographique de l'Armée, 1910. *Price 1.50 fr. each sheet.*

Cape of Good Hope. **Juta.**

Plan of Cape Town. Scale 1 : 7500 or 8·4 inches to 1 stat. mile. Cape Town: J. C. Juta & Co., 1911.

Egypt. **Survey Department, Giza.**

Provisional map of a part of the Eastern Desert of Egypt. Scale 1 : 100,000 or 1 inch to 1·6 stat. mile. Giza: Survey Department, 1910. *Presented by the Director-General, Survey Department.*

Includes Zeit and Jemsa bays, on the Gulf of Suez, with the coast country for about 25 miles to the north. The detail south of Wadi Belih and the islands are taken from Admiralty Chart No. 1871, while the remainder is from surveys made in 1909–10.

Egyptian Sudan. **Survey Office, Khartum.**

Map of the Egyptian Sudan. Compiled at the Survey Office, Khartum. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. Sheets: 34–L, Selima; 34–P, J. Hadada; 35–K, Abu Tabac; 35–L, Deraheib; 35–P, J. Abu Dueim; 36–M, Mohamedgul; 44–G, Lagia; 44–D, J. Abiad; 44–F and G, Bir Sultan; 44–H, Matassi; 44–K, J. Rahib; 44–L, Abu Tabari; 44–O, J. Nagagir; 44–P, J. El Ein; 45–C, Abu Hamed; 45–D, Wadi Amur; 45–G, Berber; 45–I, Soteir; 45–J, Bayuda; 45–K, Atbara; 45–M, Elai; 45–O, Shendi; 45–P, Goz Regeb; 54–C, J. Aga; 54–D, Um Seneita; 54–G, Um Badr; 54–H, Katul; 54–K, Foga; 54–L, El Gleid; 54–O, El Nahud; 54–P, Abu Zabbad; 55–I, El Obeid; 55–J, Abba island; 55–N, Jebelein; 65–C, El Buta; 65–D, J. Dago; 65–G, Fishik; 65–H, Lake Keilak; 65–I, Hofrat el Nahas; 65–J, Kabaluzu; 65–K, Achwang; 65–L, Hasoba; 65–M, Said Buldas; 65–N, Raga; 65–O, Ajak; 65–P, Meshra el Rek; 77–B, Deim Zubeir; 77–C, Wau; 77–D, Tong; 77–F, Deim Bekir; 77–G, Sulh river; 77–H, Rumbek; 77–K, Tembura; 77–L, Bangbi; 77–O, Yambio; 77–P, Mt. Baginze; 78–A, Ghaba Shambe; 78–E, Atwot; 78–F, Bor; 78–I, Worrah; 78–J, Mongalla; 78–M, Yei; 78–N, Gondokoro; 86–A, Mont Wati; 86–B, Dufile. Khartum: Survey Office, 1908–1910. *Presented by the Director of Sudan Surveys.*

Mauritania. **Gerhardt.**

Carte des Régions nord de la Mauritanie d'après les itinéraires de la Colonne de l'Adrar (Décembre 1908—Décembre 1909) par le Capitaine Gerhardt. Scale 1 : 1,000,000 or 1 inch to 15·8 stat. miles. Paris: Service Géographique des Colonies, 1910.

Mauritania is the name given to that portion of French West Africa between Senegal and the Spanish territory of Rio del Oro. This map includes the greater part of the region, and extends to the north as far as lat. 25° N., thus showing Adrar and the Sahara region to the east of Rio del Oro. The physical features of the region, such as sand-dunes, mountains, palm groves, wadis, wells, etc., are clearly shown by colours and symbols.

Tunis. **Service Géographique de l'Armée, Paris.**

Carte topographique de la Tunisie. Scale 1 : 50,000 or 1·3 inch to 1 stat. mile. Sheet xxxii. Souk el Arba. Paris: Service Géographique de l'Armée, 1910. *Price* 1.50 *fr. each sheet.*

Tunis. **Service Géographique de l'Armée, Paris.**

Carte de la Tunisie. Scale 1 : 100,000 or 1 inch to 1.6 stat. mile. Sheet lxiv. Nakta. Paris: Service Géographique de l'Armée, [1910]. *Price* 1·20 *fr. each sheet.*

AMERICA.

Argentine Republic. **Martinez.**

Mapa General de la República Argentina. [Por Alberto B. Martinez.] Scale 1 : 5,000,000 or 1 inch to 78·9 stat. miles. Buenos Aires, 1910.

A one-sheet general map of a diagrammatic character, showing railways and telegraphs. On the back of the map will be found statistical tables dealing with industries, products, etc., together with a considerable amount of up-to-date information concerning the country generally, such as would be useful to intending immigrants.

Argentine Republic. **Ministerio de Obras Públicas, Buenos Aires.**

República Argentina. Red de Ferrocarriles en la Fecha del Centenario. Confeccionado con los datos obtenidos por la Dirección General de Ferrocarriles. Scale 1 : 2,000,000 or 1 inch to 31·5 stat. miles. 3 sheets. Buenos Aires: Ministerio de Obras Publicas, 1910.

Although specially intended to show lines of railways, this forms a good general map of the whole country. The topographical features have been drawn with more care than is usual with railway maps, political divisions are clearly shown, and altogether the map is a creditable production.

Canada. **Department of the Interior, Ottawa.**

Sectional map of Canada. Scale 1 : 190,080 or 1 inch to 3 stat. miles. Sheet 219, Humboldt, revised to November 26, 1910. Ottawa: Department of the Interior, Topographical Surveys Branch, 1910. *Presented by the Department of the Interior, Ottawa.*

Colombia. **Fernandez.**

Plano de las Lineas Telegráficas de la Republica de Colombia. Levantado de Orden del Exmo. Sr. Presidente de la Republica, General Rafael Reyes, Siendo Director-General de correos y Telegrafos el Sr. Manuel J. Guzman por Francisco J. Fernandez, Administrador General de los Telégrafos y Telefonos nacionales. Scale 1 : 1, 400,000 or 1 inch to 22·1 stat. miles. [Bogota], 1908.

An outline map, without hill-shading, showing clearly railways, telegraph cables, and overland telegraph lines projected and constructed. An index to places through which telegraph lines pass is given as an inset.

Cuba. **Rand, McNally & Co.**

Rand, McNally's Indexed Pocket Map of Cuba. Scale 1 : 2,407,680 or 1 inch to 38 stat. miles. Chicago and New York: Rand, McNally & Co., 1910. *Price* 25 *cents.*

GENERAL.

World. **Montague.**

The Etienne Flat Globe. Designed by E. Montague. Winchelsea: Etienne Frères, [1910]. *Presented by E. Montague, Esq.*

This so called ingeniously constructed "Flat Globe" consists of circular maps of

the eastern and western hemisphere, placed back to back, mounted in a brass frame, and supported by a pedestal or stand which can be placed on the floor of a study or schoolroom. The circular brass frame carrying the maps can be rotated at the north and south poles of the maps, as in the case of a globe, so that either the eastern or western hemisphere can be brought in front of a person consulting it. The maps measure 28 inches in diameter, while the pedestal and map together stand 5 feet 6 inches in height when placed on the floor. There are two pairs of maps: one shows, in outline, political divisions, steamer routes, railways, principal products and other information connected with commercial geography, while the other, which can be fastened by screws on to the face of the former, consists of raised models intended to show the general relief of the land areas of the globe. There is decided room for improvement in the manner in which both the political and relief maps, or models, have been constructed, and in fact the latter, owing to great exaggeration in vertical scale, and general want of accuracy, are far from satisfactory. When not in use the "Flat Globe" can be placed against a wall, and so occupies less space than an ordinary globe, but otherwise it is difficult to see what advantage it possesses over a wall map of the world in two hemispheres.

World. **St. Martin and Schrader.**

Atlas Universel de Géographie construit d'après les sources originales et les documents les plus récents, cartes, voyages, mémoires, travaux géodésiques, etc., avec un texté analytique. Ouvrage commencé par M. Vivien de Saint Martin et continué par Fr. Schrader. Carte No. 48, Mongolie. Paris: Hachette & Cie., 1910. *Presented by the Publishers.*

This is the fifth sheet to be published of the ten-sheet map of Asia which is being prepared for this atlas, and embraces the region lying between the gulf of Pe-Chili and Kobdo in an east-and-west direction, while it extends from Lake Baikal in the north to Koko-nor in the south. It is well drawn and engraved, but as so much geographical exploration is at present in progress in the region, it will be necessary before many months to issue a revised edition of the sheet.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during December, 1910. *Presented by the Hydrographer, Admiralty.*

New Charts—No. 644, Africa, east coast: Delagoa bay, 4*s*. 3758, Borneo, west coast: Tanjong Beras Basah to Masa Tiga island, 3*s*. 2192, Plans in Sakhalin island: Kusunnai road, Maoka kō, Tomarioru road, Tokombo road, Soni misaki and approaches, Nodosan road, Poro-Tomari road, Todo shima, Okō road, Kunshunkotan (*Korsakovsk*) road, 3*s*. **New Editions**—No. 2585, England: Coastguard stations, 3*s*. 2586, Scotland: Coastguard stations, 3*s*. 2587, Ireland: Coastguard stations, 3*s*. 512, Scotland, west coast: approaches to Stornoway, 2*s*. 2397*b*, Scotland, north and east coasts: north sheet, 4*s*. 6*d*. 2182*a*, North sea, southern sheet, 4*s*. 2182*b*, North sea, northern sheet, 4*s*. 2361, Baltic sea, Oland to Landsort, 3*s*. 3199, Baltic sea, Norrköping bight, 3*s*. 1, British islands to Mediterranean sea, 3*s*. 87, Spain and Portugal: west coast: Cape Finisterre to Cape St. Vincent, 3*s*. 1440, Adriatic, 3*s*. 374, Africa, north coast: Ras Bulau to Alexandria, 4*s*. 1912, Africa, north coast: Tangier bay, 4*s*. 1850, Canary islands: Fuerteventura, 2*s*. 863, Labrador: Hudson bay and strait, 4*s*. 232*b*, Newfoundland: northern portion, 4*s*. 3405, Newfoundland: Peter arm, 2*s*. 284, Newfoundland: Cow head harbour to St. Geneviève bay, 3*s*. 3016, Newfoundland: Cow head to Rich point, 3*s*. 1690, Newfoundland: Hawke bay to St. Geneviève bay, 3*s*. 2884, North America, east coast, Florida reefs: Legaré anchorage, 2*s*. 2434, Columbia: Cartagena harbour, 3*s*. 645, Plans on the east coast of Peru, 3*s*. 1862, Africa, west coast: Lekki to river Dodo, 3*s*. 2160, Carimata strait, 3*s*. 2674, Anchorages on south coast of the Celebes, 2*s*. 1414, Anchorages in the Solomon islands, 3*s*. 2658, Solomon islands: Gavutu and Tulagi harbours, 3*s*.

Atlantic. **U.S. Weather Bureau.**

Meteorological chart of the North Atlantic Ocean, March, 1911. Meteorological chart of the South Atlantic Ocean, Season March, April, May, 1911. Washington: Department of Agriculture, U.S. Weather Bureau, 1911. *Presented by the U.S. Weather Bureau.*

Atlantic, North. **U.S. Hydrographic Office.**

Pilot chart of the North Atlantic Ocean, January, 1911. Washington: U.S. Hydrographic Office, 1911. *Presented by the U.S. Hydrographic Office.*

Atlantic, North, and Mediterranean. **Meteorological Office.**

Monthly meteorological charts of the North Atlantic and Mediterranean, January, 1911. London: Meteorological Office, 1911. *Price 6d. each. Presented by the Meteorological Office.*

Burma. **Hunton and Smith.**

Burma: Rangoon port. Surveyed January to August, 1910, by A. S. Hunton, river surveyor, assisted by V. G. Smith, under the direction of H. G. G. Ashton, deputy-conservator of the port. Scale 1:12,102 or 5·2 inches to 1 stat. mile. Rangoon: Commissioners for the port of Rangoon, 1910. *Presented by H. G. G. Ashton, Esq.*

Shows numerous soundings of recent surveys, present position of sandbanks, lights, and other information important to the navigator.

Denmark. **Kgl. Danske Sökort-Arkiv.**

Kort udgivet af det Kongelige Danske Sökort-Arkiv: Nos. 226, Islands Sydkyst, Portland-Reykjavik; 233, Islands Vestkyst, Snæfellsjökull-kapnord; 234, Islands Vestkyst, Faxe-Bugt; 236, Skagerrak; 239, Island og Færöerne. Copenhagen: Kongelige Danske Sökort-Arkiv, 1910. *Presented by the Danish Admiralty.*

Indian Ocean. **Meteorological Office.**

Monthly meteorological charts of the Indian Ocean, February, 1911. London: Meteorological Office, 1911. *Price 6d. each. Presented by the Meteorological Office.*

Indian Ocean. **U.S. Hydrographic Office.**

Pilot chart of the Indian Ocean, March, 1911. Washington: U.S. Hydrographic Office, 1911. *Presented by the U.S. Hydrographic Office.*

Indian Ocean. **U.S. Weather Bureau.**

Meteorological chart of the Indian Ocean, March, 1911. Washington: Department of Agriculture, U.S. Weather Bureau, 1911. *Presented by the U.S. Weather Bureau.*

Pacific. **U.S. Weather Bureau.**

Meteorological chart of the North Pacific Ocean, March, 1911. Meteorological chart of the South Pacific Ocean, Season March, April, May, 1911. Washington: Department of Agriculture, U.S. Weather Bureau, 1911. *Presented by the U.S. Weather Bureau.*

Pacific, North. **U.S. Hydrographic Office.**

Pilot chart of the North Pacific Ocean, February, March, 1911. Washington: U.S. Hydrographic Office, 1910. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Belgian Congo. **Robins.**

Six photographs of the Belgian Congo, taken by H. G. Robins, Esq. *Presented by H. G. Robins, Esq.*

Good enlargements of typical Congo scenery and natives, measuring 10 × 12 inches.

(1) An indaba in Mnanga's village on the Kasanga river; (2) Zazi's village on the Lubudji river; (3) The Lualaba river; (4) Medicine man, Wandembo people, near Lubudji river; (5) Waluba youngsters paid off; (6) Zambezi river, a few miles below Deka river confluence.

Central Asia. **Morrison.**

One hundred photographs taken in the course of a journey across Central Asia from Honan to Andijan, by Dr. G. E. Morrison, 1910. *Presented by Dr. G. E. Morrison.*

An excellent series of remarkably clear photographs, measuring 3½ inches by 5½ inches, carefully described and bound in an album.

(1) At the fair at Tien-chang-i; (2) Remnant of a former temple; 3 My carts near Pin-Chou; (4) Avenue on the way to Ping-liang Fu; (5) View in Pai-shui Ssŭ;

(6) Guard-house with watch-tower and five beacons seen every 10 li; (7) Loess gulch near Hui-ning Hsien; (8) Children who gather animal droppings; (9) Wayside shrine with praying-wheel moved by water from spring; (10) The Great Wall, with the guard-house and the mud ruins; (11) Shih-pa-li-p'u, people standing at my inn door; (12) On way to Ku-lan Hsien; (13) A village beauty; (14) Liang Chou, main street; (15) Liang-Chou, twin pagodas inside Anting-mên; (16) Liang Chou, view looking north from Chung-lou; (17) Bishop Otto's seminary; (18) My guide from Bishop Otto's; (19) Characteristic ruins, Tsu-chih-li-p'u; (20) The ordinary defensible occupied farmstead of Liang Chou plain; (21) My carts and ponies; (22) Dagoba at Shan-tan Hsien; (23) Village 15 li west of Shan-tan Hsien; (24) Kan Chou, the Tien-chu-t'ang; (25) The Buddhist temple with the gigantic reclining Buddha; (26) Train of camels in the soda-encrusted spongy plain 10 miles east of Kao-tai Hsien; (27) Farmhouse on outskirts of Hei-ch'üan; (28) Watch-tower in oasis of Lin-shui; (29) View from Splingaerd's Yamen, Su Chow; (30) My caravan 20 li east of Chia-yü-kuan; (31 and 32) Chia-yü-kuan; (33) The only soldier in the guard-house at mid-day, old style; (34) Group at our mid-day rest-house; (35) Old woman in Huo-kou; (36) The only inn at the stage of Ch'i-tao-kou; (37) East gate of An-sih Chou ruins; (38) Mid-day halt in the desert; (39) The two Taoist priests of the wayside Kuan ti miao at Huang-yüan-tzu; (40) The Kuan-ti-miao, built by the Taotai Hsü; (41) Chag-hiu-shui; (42) Huang-lu-kang; (43) Ch'ant'ous at Hami; (44) South gate of Hsin-ch'êng; (45) Tomb of the Hami princes; (46) Village of Erh-p'o-ch'an 'tou; (47) My Ch'ai Jên from Liao-tun; (48) The peilu on the way to T'ou-shui; (49) Unemployed seated near dome-shaped shelter; (50) Tsu-shih-li-p'o where we camped in the open steppe; (51) Ch'ant'ou man and Mohammedan boy near Urumchi; (52) Urumchi, Liang P'ing; (53) Urumchi, the Duke Lan; (54) Urumchi, the provincial judge; (55) Urumchi, site of execution of Chang-yin-huan; (56) Camel caravan of Hassas in the steppes; (57) Cart with load of brushwood in plain; (58) Island and temple in Sairan Nor near San-t'ai; (59) In the Pine pass between the lake and Erh-t'ai; (60) Hassas near Sairan Nor *en trek* for Tarbagatai; (61) Ku-lou of Hsin-ch'êng; (62) Mongols in Kuldja; (63) The Ili ferry, Kuldja; (64) View in Kuldja; (65) Taranchi father at Tu ma shuk pata ba; (66) Hassa tents and sheep near Ili valley; (67) The Ili ferry; (68) Hassa oxen carrying timber; (69) Caravan in hills; (70) Lamasery of Hu-no-kai; (71) Sarts purchasing horses; (72) Musart pass; (73) On the Japarlik glacier, Musart pass; (74) Tan-ta-shih from across the Musart river; (75) My caravan bashi, Kuldja to Aksu; (76) View looking up the lower Musart valley; (77) Hsin-ch'êng; (80) Our people at Chodir; (81) Kupru Robart, view taken late in the evening; (82) On the way to Kashgar; (83–89) Kashgar; (90) Tablet temple, Min-yul; (91) Kirghiz tent and child; (92) River crossing at Aksalar; (93) Ulugchat; (94) Fort at Yehgin; (95) The Kizil Su near Irkeshtam; (96) Kirghiz old gentlemen in the Tuan Muran; (97) Kirghiz lady in the Tuan Muran; (98) View looking west from the Taldek pass; (99) Near Kizil Kurghan; (100) Cart near Osh.

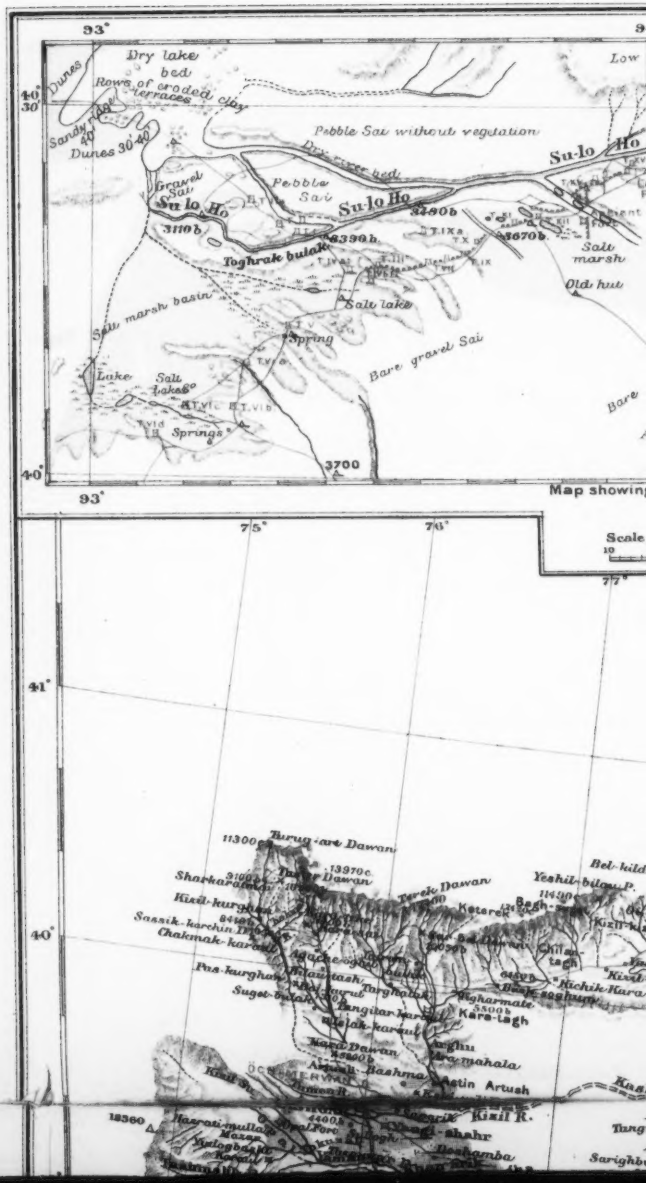
Uganda. **Hall.**

Seventeen photographs, of Uganda, taken by Captain C. R. Hall, Royal Munster Fusiliers. *Presented by Captain C. R. Hall.*

These photographs, measuring 2¼ inches by 3¼ inches, were taken last year during an expedition to the Ruanda country, not far from the western boundary of Uganda.

(1) Natives of Mpororo road making; (2) Women of Mpororo district preparing food; (3) Women of Mpororo invoking spirits; (4) Old men, Mpororo district; (5) Scenery in Mpororo district; (6) One of the crater lakes in the Mpororo district; (7) River Ruwezi, which rises in Mpororo district; (8) Native of the Ruchigga district; (9) Buying food from the natives in the Ruchigga hills; (10) Expedition in the Ruchigga country; (11) A waterfall in the Ruchigga country; (12) Lake Ngezi, Ruchigga country; (13) Cattle of the Ruanda country; (14) A group of Wa-Ruanda; (15) Chief Nindu and some of his followers; (16) Group of natives living on the shores of Lake Edward; (17) Salt-market on shores of Lake Edward.

N.B. It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

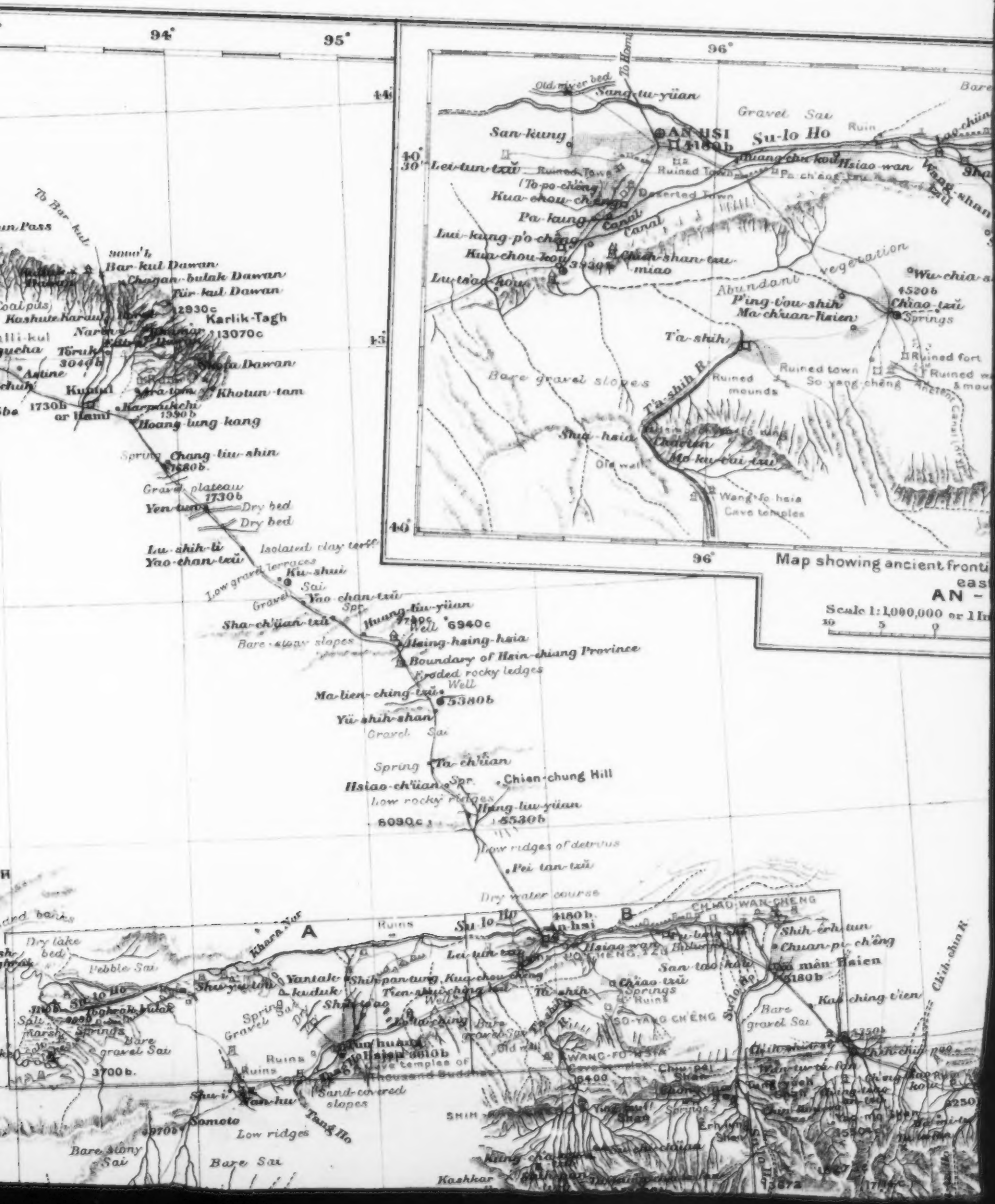

93°
Dry lake bed
Rows of eroded terraces
clay
Dunes
Sandy Dunes
40° 30'
Pebble Sai without vegetation
Dry water bed
Gravel Sai
Pebble Sai
Su-lo Ho
3110b
3390b
3290b
3670b
Toghrak bulak
Salt marsh
Old hut
Salt lake
Salt marsh basin
Spring
Bare gravel Sai
Lake
Salt lakes
Springs
3700
40°
93°
Map showing
75°
76°
77°
Scale
41°
40°
11300c
Turug-art Dawan
13970c
Tarchi Dawan
Yeshil-bilaur P.
Sharka-aralgan
Kizil-kurghan
Sassik-karchin
Chakmak-karaul
Kizil-tagh
Pas-kurghan
Suget-bulak
Tangitar-kurghan
Kara-Lagh
Kizil Dawan
Ashmah
Bashma
Astin Artush
Kizil R.
Hazrati-mullah
Mazar
Kizil-shahr
Kalagbad
Kashgar
Kashgar R.
Sarighb

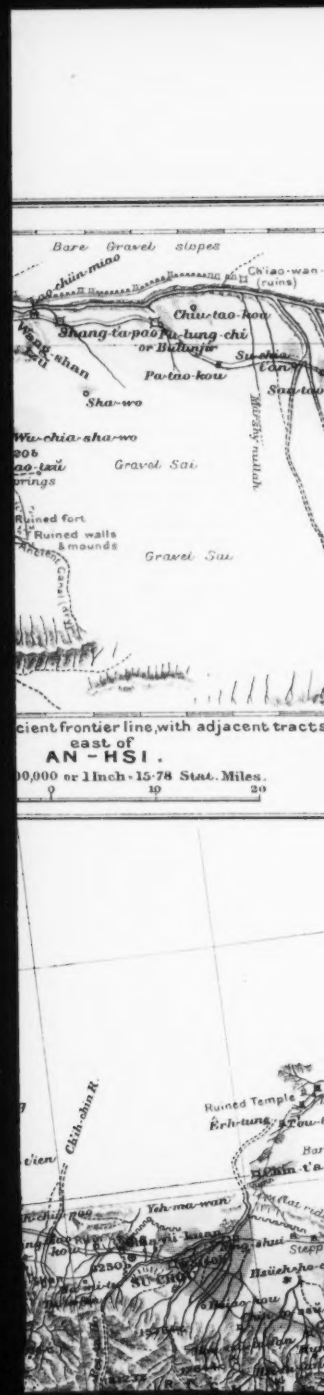
94°
95°
A
Low barren hills
Bare gravel Sai
Khara Nor
Su lo Ho
Old river courses
Dunes 15
Shui-yu-tou
Spring
Yantak kuduk
Sterile Sai
Salt encrusted Steppe
Abandoned Fields
Shih-pan-tung
(deserted town)
Chuang-tang
Chin-hsien
Shih-ta'ao
Pien-shui-ching
Kung-hai-tung
TUN-HUANG
OR
Ching-shai Hsien
SHA-CHOU
Tun-huang Hsien
3610b
Yueh-ya-chuan
4720b
Tang He
Lo-tai-ching
Bare clay steppe
Ruined temple
Abandoned Farms
Caravan dry
Gravel slopes
Pa-lun-tun
Shih-wu-tow
Cave Temples of Thousand Buddhas
Chien-Fo-tung
40°
30'
95°
p showing ancient frontier line, with adjacent tracts,
north and west of
TUN-HUANG
Scale 1:1,000,000 or 1 Inch = 15·78 Stat. Miles
10 5 0 10 20
80°
81°
82°
77°
78°
79°
Mt. ishka Dawan
Karabulak
Fakalik
Koshka-yol-kotan
Dabzi-yar
Kizil-bulak
5740b
Kone Langar
Sultan karmish-ata
Yaghak
Sairam-bulak
Kara-bagh
Kuchche
Uch-Turfan
Majadin
Aksu
Kone-shahr
Tumen
Kizil-ustang
Yangi-shahr
AKSU
3370b
Thuktal
Pakhtalik
Kum-bash
Abdu R.
Achal
Bochche
Shamba Bazar
Tiuren-sat
Matan
Guru-chat
Chinese Colony
Tushek-kair
Deserted houses
Tarim R.
Kara-dong
Zil
Danish-arai
Yalghuz-bulak
Ghaz Darya
Kone Darya
Bel-kildak Dawan
Bilati Dawan
11400b
Zigarik
Kizil-kiz
5040
Kara-bash Tagh
Yaram-bulak
Kudughun
Ancient Fort
Ruined site
Shor-tagh
Lai-tagh
Bel-tagh
Maral-bashi
Kalap-tagh
Kashgar R.
Zat-kopruk
Aksu-marai
Tungning-jejret
Alagu
Sarighbuya
Kuna R.
Sairam Mazar
Achal
(new colony)
Dry
Dunes
Wells
5 deep
Caves
Yakshamba
Bostan
Samsak
Dunes 40'
Dry

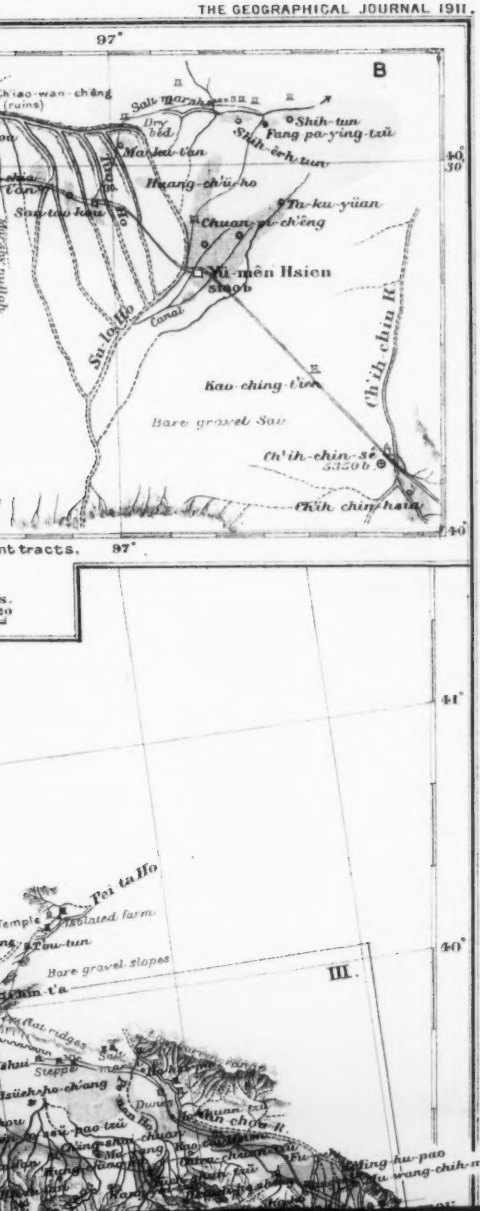
C
OASES OF
CHIRA, CULAKHMA, DOMOKO
Scale of Miles
Nat. Scale 1:500,000 or 1 inch=7·89 Stat. Mls.
Ancient Fort
Old Domoko
Deserted Village
Cholpang-ata Mazar
Kone-Ponak
Malikalagan
Tug-bashi
KUSHUK-ASTE
KHADALIK
KÖK-JIGDA
ARABZAN-DONG
Cuigulük
Domoko R.
Domoko L.
Dash
KARA-YANTAK
Karakichik-öghil
Kuilash Mazar
Karanghu-tograk
Okshal-öghil
Tug Kungan
Tsagan Dawan
Stony Sai
Yam-bulak
Gor Dawan
Khan-khora
Road to Korla
Road to Kuchar
Uzgen-bi
Bare clay steppe with dunes
Old river bed
Mukhtar-chöl
Jigda-sala
Inchike D.
Chong-tokai
Chayan D.
Tüttür D.
Kök-chöl
Marshes of Kök-chöl
Kizil R.
Rugur
Yakaarik Bazar
Yaqiabad
Chöl-abad
Springs
Ruined Temples
Simsim
Kizil-Kashe
KUCHAR
Cave temples
Ruins
Canals
Kuchara
Pailu
Charchamba B.
Bostan B.
Yakshamba B.
Hambar M.
Langar
Shahyar
Tarim R.
Shahidan Mazar
Sangtam
Koshtam
Kötek-köl
Inchike Darya
Aksyol
Old Tombs
Charchak D.
Achal
Arpalik
Dunes 15'-20'
Well
Dunes 15'-20'
Well 5' deep
Dunes 20'-30'
Well 5' deep
Low dunes
Dry bed
Dawan 300'
Dry bed
Stony ridges
Tuge-kuduk
Lachin-ata M.
Ulugh-Mazar
Kök-köl
Tuwen-ponak
Gulakhma-yar
Sarigh Mammal
Hungaliik
Yukeng Ponak
Bi-bashi
Ak-köl
Chok-bash
Dülma Arilak
Gulakhma Bazar
Domoko Bazar
Chira R.
Chira Bazar
MASHE-DONG
(mounds)
MAZAR-DOGHRAK
Akin-tuya
Khadalik-tagh
Imam-Jafar-Tairak M.
Kara-tagach
RAWAK
Khadalik-tagh
Zhadpal L.
Kan-kash
Yangi-mullalia
MAIRA-TATI
BARHAD-BEG-YAILAK
Dry bed
Dry bed
Damoko R.
Road to Akesu
Ruined Temples
Springs
Kizil-Kashe
KUCHAR
Cave temples
Ruins
Canals
Kuchara
Pailu
Charchamba B.
Bostan B.
Yakshamba B.
Hambar M.
Langar
Shahyar
Tarim R.
Shahidan Mazar
Sangtam
Koshtam
Kötek-köl
Inchike Darya
Aksyol
Old Tombs
Charchak D.
Achal
Arpalik
Dunes 15'-20'
Well
Dunes 15'-20'
Well 5' deep
Dunes 20'-30'
Well 5' deep
Low dunes
Dry bed
Dawan 300'

86°
87°
88°
89°
90°
91°
Buruluk Dawan
Sardak Dawan
Kazma
Yarkhoto
Springs
Yamshe
Toksun
Tsagam-tarim
Kirik-ote
Kara-shahr R.
KARA-SHAHR
Shikotsin
Baghrash
approx. position
Road to Kuchar
Uzgen-bulak
Karla
Tuzkun
Monche Mt.
Toghrak-bulak
Tarim R.
Khaurga-Tagh
Kizil Tagh
Shidaerh Tagh
Jeki-shahr
Gravel glacis of Kuruk Tagh
Yangi-bulak (approx.)
Temple ruin
Ancient Site
Ancient debris
Dead trees
Merdek-kol
Ruined fort
Dead Toghrak
Dry lake
Salt pools
Kiteklik-kol
Salt
Shirghe-chappgan
Yangi-kol
Chöl-kol
Chaiuk-kol
Kurghan
Lowaza Springs
Flat ridges covered with dunes
Temple ruins
Degar
Kum Dawan
Achchik-bulak
Arghai-bulak
Ujme-dong
Rumkash
Thrian-bulak
Arpash-bulak
Perau-khoja-bulak
Tumey-bulak
Singer
Altun-ghol
Ulan-bulak
Dawan
Elyasan
Dawan
Kuche D.
Tsagam-tarim
Kirik-ote
Kara-shahr R.
Ruined Fort
Karkir-tau
Low ridges
Ush-kipkal
Hsin-ching-tzü
Dawan
Khara Khoja
Shahid-shahri
Yar
Kara-shahr
Kuche D.
Karla
Tuzkun
Monche Mt.
Toghrak-bulak
Elyasan
Dawan
Tarim R.
Igda-sala
ke D
Buruluk Dawan
Sardak Dawan
Kazma
Yarkhoto
Springs
Yamshe
Toksun
Tsagam-tarim
Kirik-ote
Kara-shahr R.
KARA-SHAHR
Shikotsin
Baghrash
approx. position
Road to Kuchar
Uzgen-bulak
Karla
Tuzkun
Monche Mt.
Toghrak-bulak
Tarim R.
Khaurga-Tagh
Kizil Tagh
Shidaerh Tagh
Jeki-shahr
Gravel glacis of Kuruk Tagh
Yangi-bulak (approx.)
Temple ruin
Ancient Site
Ancient debris
Dead trees
Merdek-kol
Ruined fort
Dead Toghrak
Dry lake
Salt pools
Kiteklik-kol
Salt
Shirghe-chappgan
Yangi-kol
Chöl-kol
Chaiuk-kol
Kurghan
Lowaza Springs
Flat ridges covered with dunes
Temple ruins
Degar
Kum Dawan
Achchik-bulak
Arghai-bulak
Ujme-dong
Rumkash
Thrian-bulak
Arpash-bulak
Perau-khoja-bulak
Tumey-bulak
Singer
Altun-ghol
Ulan-bulak
Dawan
Elyasan
Dawan
Kuche D.
Tsagam-tarim
Kirik-ote
Kara-shahr R.
Ruined Fort
Karkir-tau
Low ridges
Ush-kipkal
Hsin-ching-tzü
Dawan
Khara Khoja
Shahid-shahri
Yar
Kara-shahr
Kuche D.
Karla
Tuzkun
Monche Mt.
Toghrak-bulak
Elyasan
Dawan
Tarim R.
Igda-sala
ke D

90°
91°
92°
93°
To Urumchi
To Bar
Tung-yen-tzu
Ch'i-ku-chang
Koilak-otun Pass
Buyuluk Dawan
7690c
Well
Gravel Sai
Hui-ching-tzu
Hei-yen-ch'ih
Shotu-bulak
Spring
Kercha
3540b
Bare gravel Sai
Liao-ti-ti
Dash-kiser
Coal pits
Kashute
Ch'u-tun-tzu
Oktam
Fort
Kiriklik Ly.
Tarancha
Alli-kul
Tuguchu
Ruined Shrines
Aqpchuk
Aqraldbe
1730b
Kaghalura
3807b
at ridges covered with dunes
KURUK TAGH
4006c
3790c
4133
Sharp crested bank
Dry lake bed
Kuruk Tagh (approx)
terraces
Ancient Site
4420 b.
Rosh-kuduk
2820b
Well
Ruin-kuduk
Well c.150
Springs
Achik-kuduk
Steep clay terraces
Sand ridge
broad dunes up to 400' high
ridge of coarse sand
trees
Lakes enclosed lake bed
Spring
Steep clay terraces
40' high
Kosh-langza
2430b
Lowaza
Springs
Steep terrace
DESERT


94°
95°
96°
To Par-kul
Bar-kul Dawan
Chagan-bulak Dawan
Tür-kul Dawan
Karlik-Tagh
13070c
Khotun-tam
Kuruul
Harpuk-chi
Hoang-lung-kang
Chang-liu-shin
Yen-tung
Dry bed
Lu-shih-li
Yao-chan-tzŭ
Isolated clay tariff
Low gravel terraces
Ku-shui
Gravel Sai
Yao-chan-tzŭ Spr.
Huang-liu-yüan
Sha-ch'üan-tzŭ
6940c
Haing-haing-haia
Bare stony slopes
Boundary of Hsin-chiang Province
Eroded rocky ledges
Well
Ma-lien-ching-tzŭ
5380b
Yü-shih-shan
Gravel Sai
Spring
Ta-ch'üan
Hsiao-ch'üan Spr.
Chien-chung Hill
Low rocky ridges
Hung-liu-yüan
5530b
6030c
Low ridges of detritus
Pei-tan-tzŭ
Dry water courses
Dry lake bed
Pebble Sai
Khara-Nor
Su-lo Ho
Ruins
Yantak
Shih-pan-tung
Kuk-yuk
Kuduk
Tien-shih-ying
Ta-shih
Shui-yü-ho
Sprung Gravel Sai
Bare gravel Sai
Ruins
Hung-huaza
Hsiao-ch'üan
Caves temples or thousand Buddhas
Sand-covered slopes
Somoto
Low ridges
Tang-ho
Bare stony Sai
Bare Sai
Kashkar
SAN-SHI
Old river bed
Yang-liu-yüan
San-kung
Lei-tun-tzŭ
Ruined Town
To-po-ch'eng
Deserted Town
Kua-chou-ch'eng
Pa-kung-ch'eng
Canal
Lui-kung-p'o-ch'eng
Kua-chou-tzŭ
Ch'ih-shan-tzŭ miao
Lu-tsao-kou
Abundant vegetation
Ping-tou-shih
Ma-ch'uan-hsien
Springs
Ta-shih
Ruined town
Ruined fort
Bare gravel slopes
Ruined mounds
So-yang-ch'eng
Ancient Canal
Shui-hsia
Ch'ien-fo-tung
Ma-ku-tzu-tzŭ
Old well
Wang-fo-hsia
Cave temples
Gravel Sai
Ruin
Huang-chu-kou
Hsiao-wan
Wu-chia-
Ruined fort
Ruined town
Ruined mounds
Map showing ancient fronti
east
AN –
Scale 1:1,000,000 or 1 In
A
B
CHIAO-WAN-CHENG
Shih-erh-tun
Chuan-pi-ch'eng
San-tao-ho
Ma-mên-hsien
Kuo-ching-ch'eng
Ch'ih-shan R.
Ch'ien-chin-tzŭ
Ch'ien-fo-hsia
Chung-pei
Erh-hsing
Shih-fo-tung
Springs
Ruins
Ruined Town
Ruined Fort
Ruined Mounds
Caves
Temples
Old Well
Gravel Sai
Bare gravel Sai
Sprung Gravel Sai
Pebble Sai
Bare stony Sai
Bare Sai
Low ridges
Sand-covered slopes
Caves temples or thousand Buddhas
Dry lake bed
Dry water courses
Low rocky ridges
Eroded rocky ledges
Isolated clay tariff
Low gravel terraces
Bare stony slopes
Boundary of Hsin-chiang Province
Well
Spring
Gravel Sai
Dry bed
Ruins
Ruined Town
Ruined Fort
Ruined Mounds
Caves
Temples
Springs
Old Well
Gravel Sai
Bare gravel Sai
Pebble Sai
Bare stony Sai
Bare Sai
Low ridges
Sand-covered slopes
Caves temples or thousand Buddhas
Dry lake bed
Dry water courses
Low rocky ridges
Eroded rocky ledges
Isolated clay tariff
Low gravel terraces
Bare stony slopes
Boundary of Hsin-chiang Province
Well
Spring
Gravel Sai
Dry bed


Bare Gravel slopes
Chiao-wan (ruins)
Chiu-tao-kou
Shang-ta-pao
Ku-tung-chi or Buttons
Pa-tao-kou
Sha-wo
Wu-chia-sha-wo
Gravel Sai
Ruined fort
Ruined walls & mounds
Gravel Sai
cient frontier line, with adjacent tracts
east of
AN-HSI.
0,000 or 1 Inch = 15·78 Stat. Miles.
0
10
20
Ruined Temple
Yeh-ma-wan
SU-CHOU


97°
B
Salt marsh
Dry bed
Shih-tun
Fang pa-ying-tzŭ
Shih-êrh-tun
Huang-ch'ü-ho
Ta-ku-yüan
Chuan-ni-ch'êng
Yü-mên Hsien
Su-lo Ho
Canal
Ch'ih chin K.
Kao-ching-t'ien
Bare gravel Sav
Ch'ih-chin-tzŭ
Ch'ih chin hsien
40°
30'
97°
41°
40°
Pei ta Ho
Isolated farm
Bare gravel slopes
III.
Steppe
Kuan chou K.
Ch'ing-hu-pao
Yu wang-chih-miao

Kizil R.
Shahr
Karaboktor Pk
20570
Turning-bashi
Hulun-kul
Lit. Karakul
Mustagh
Tash kurghan
Lakhshun Pass
20722
Darkot
Yasin
Gilgit
Kashgar
Yarkand
Khotan
Kazma
Topa Dawan
Hokyar Dawan
Karakoram Dawan
Maksum-bulak
To Leh
Kara-tagh
Kara-kash R.
Salt Lake
Dry salt beds
KOILOGH-ATA
YARKAND
Khushabad
Kargahlik
Akin
Koshlak
Guma
Chaparkhana
Kullangar
Togujai
Yangi Hissar
Karaul
Chamulung
Kilian
Mainat
Tungning jejyre
Alagu
Sarighbuya
Okuna
Lagoons
Charchamba Bazar
Kumush-mahalla
Lai-dang
Terek
Tigmen-bashi
Togrash
Yangi-shahr
Kosh-tagh
Kok-yar
Ighiz-yar
Kalpin
Hazrat-begin
Mesha
Pulshah
Lailak
Turim
Aksu-marai
Tatar-koppa
Kizil-jilga
Kaz-kichik
Jai-terek
Tagorma
Arik
Akin
Koshlak
Ordak
Kok-tagh
Kok-yar
Kuchuk
Shahidulla
Yangi-hissar
Kara-tagh
Darwaza
Kara-kash R.
Yarkand R.
Tarim R.
Yurung-kash R.
Khotan R.
Kizil R.
Karanguli
Mazar
Yangi-kurgan
Kizil-kurgan
Kizil-kurgan Pass
Yangi-kurgan Pass
Bordash Pass
Baldir
Darkot
Tashkurghan
Yasin
Gilgit
Yarkand
Khotan
Kashgar

Ghaz Darya
Kone Darya
Inchike Daryа
Tigdalik-aral
Bora-chushkan
Roze bai-tunshuki
Mandartik-öghil
Kangning-masjidi
Korla-ayaki
Hedin's post
Ayak-östang
Besh-östang-aghzi
Ayak-östang-aghzi
Höksam-öghil
Tonguzluk
Chiga-satma
MAZAR-TAGH
Ak-bash
Chiga-satma
Yoghan-kum
Kashlash Langar
Momen
Malghun
Bilangan
Misalai-öghil
Chong-sai R.
Otar-öghil
Chöl-öghil
Rawak
Kara-köl
Mirawrit
Kosh-satma
Islamabad
Dandan-oilik
Klak-chakma
Charib-chakra
Stupa
Ancient bridge
Basuk-öghil
Tukagh-öghil
Kochkar-öghil
Imam Jafar Sadik Tr.
Chigil-korghan
Patal-öghil
Burhanuddin M.t
Dibe Bostan
Otra Langar
Muso Begum Langar
Kosh-kiok
Turning bulak
Hassanutim
Shivul
Bostan
Keriya
Dig
Yol-arish
Kone-bagh
Shukurbagh
Geju R.
Ancient delta of Keriya R.
Dead Forest
Dry lakelets
Dry river bed
Actual Keriya River bed
Sand ridge 60'
Dawan 300'
Wall 5' deep
Wall 14' deep
Low dunes
Dry bed
Dawan 10'
Stupa
Graves
Salt Lake
Dry salt bed
Gravel slopes
Gravel Slope
L. Lighten
Keriya R.
Seghiz Kol
Ulugh Kol
Kiabu Halim
Tikelik
Yangi-ariq
Kara-kash R.
Khotan R.
Yurung-kash R.
Khotan-Keriya R.
Kara-kash
Ulugh-Mazar
Imam-asitan Mazar
Chapan-kaldi
Yarwakkol
Mirawrit
Yurtchilak Langar
KINE-TOKMAK
KAWAK STUPA
KARA-KUDUK TIM
Tokhtunuz
Kaplo-Mazar
Duwa Bazar
Ulugh-Mazar
Imam-asitan Mazar
Yangi-Bazar
Kara-kash
Yangi-ariq
Tikelik
Hukusche
Chomshe
Mazar
Yurung-kash
Kokpatar
Dawan
Salt Lake
Dry salt bed
Gravel slopes
Dry Stupas
Gravel Slope
Graves
Salt Lake
Dawan
Dawan
Dawan

A N D E S E R
Low dunes
Dunes 20'-30'
Dry bed
Dawan 300'
Well 5' deep
Dry bed of Keriya R. (dry)
Well 14' deep
Sand ridge 60'
Dry lakelets
Keriya River bed
Lashkar-sa
Ak-ilak
Old Cemet
Tatran
YALGHUZ DONG
Yoghan-dong
Supe-dong
Kalasti
Charchan
LALULIK TATI
Yantak
Kara-kum
Kadir-kum
MIYA R. SITE
Stupa
Ancient bridge
Tilkuch köl
Jafar Sadik Mtn
Dobe Bostan
Otra Langar
Begim Langar
Turning bulak
Ruins of old fort
ENDERE
Ziarat
Yartungatariq
Arik-aqsaq-oghil
Uc-juyo-olgan
Tokuz-kol-oghil
Haidil-shah
Well-kiyari
Stupe
Ruined fort
Jigdalik
Kiyik-tashan
Ak-Jigda-oghil
Shudan-oghil
Chenglik
Well
Tuilik-tukan
Well
Tuilik-kuduk
Well
Moicha R.
Karamaran R.
Keshal Ch.
Kashgar-Khotan Road
Yarkand-Khotan Road
Yarkand R.
Karanga-tagh
Moicha (Goldmine)
Arpalik Chaka
Yar Dawan
Kara-mazar R.
Kara-sai
Kara-tash
Kara-tash Sai
Yartungatariq R.
Yartungatariq Sai
Tiltala Padshahim
Kalmak-kuduk
Toghat II.
Orra L.
Yulghun
Ulugh-Dalai
Ulugh-Dalai Sai
Ulugh-Dalai R.
Ulugh-Dalai Pass

Kötekdik-köl
Salt
Shirghe-chapgare
Yangi-köl
Chöl-köl
Chaimat-köl
Kurghan
Ulugh-chöl
Kara-koshun
Yanghi-sar
Tarim R.
Charchan R.
Kokal
Kara-gakal
Naji-bajin
Tatran
Yandash Kak
Yillik-bulak
Ruined Site
Chaggalik
Pailu
Yaka-toghrak
Loshkar-aatmo
Ak-ilak
Steppe
Chima-olgan
Stony plateau
Sand
Khotaghur
Bash-kurghan
Lop River
Lop Nor
Pebble Sai
Sand Sai
Reed Sai
Reed Channel
Tamarisk Jungle
Tamarisk Scrub
Well
Camp
Ruined Fort
Ruined Houses of Yangi-shahr
Old Course of Tarim R.
Old Course of Charchan R.
Tarim R.
Yangi-shahr
Kara-koshun
Mirran
Fakhta-butak
Bare Sai
Pebble Sai
Stony Camp
Loshkar R.

SHOWING PORTIONS OF

TURKESTAN AND KANSU

illustrate the explorations of

DR M. AUREL STEIN,

Indian Archaeological Survey,
and his assistants

SINGH AND R. S. RAM SINGH.

1906-08.

the map on the Scale of 1:253,440
published by
Surveyor General of India.

Scale of Miles

50 100 200

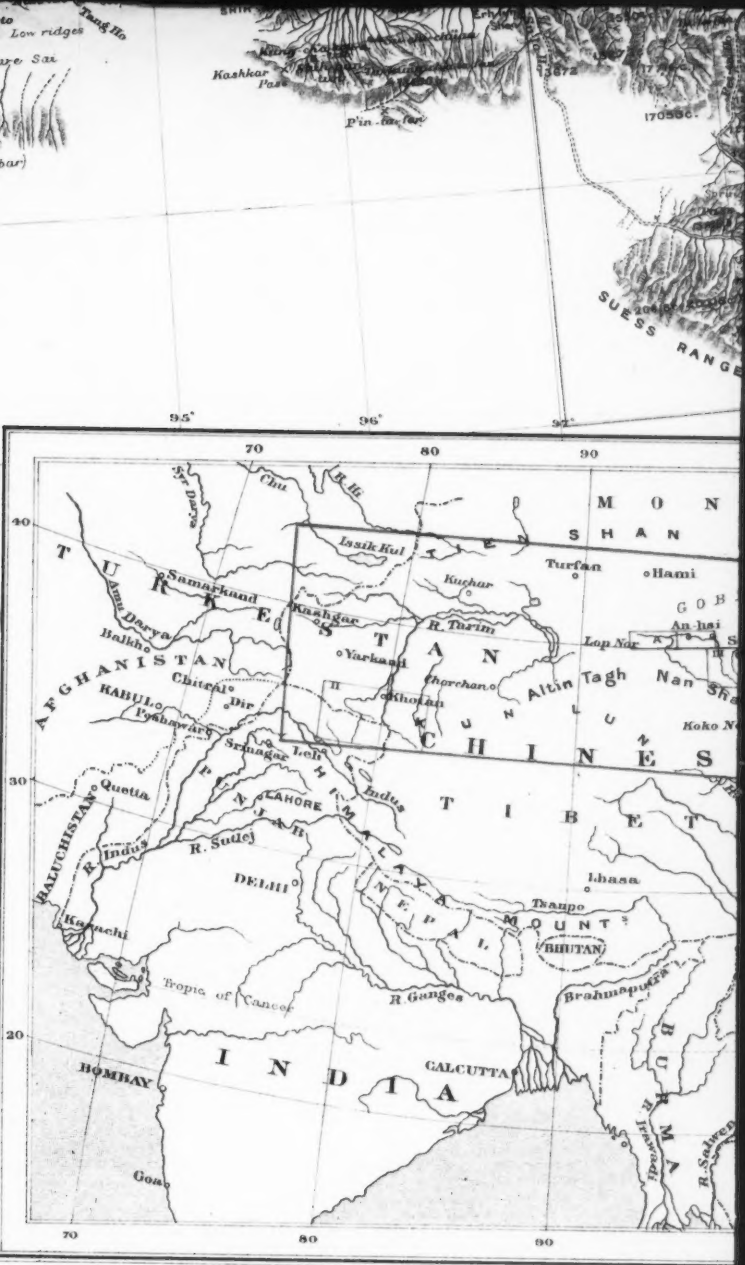
Natural Scale 1:3,000,000 or 47·34 Miles = 1 Inch.

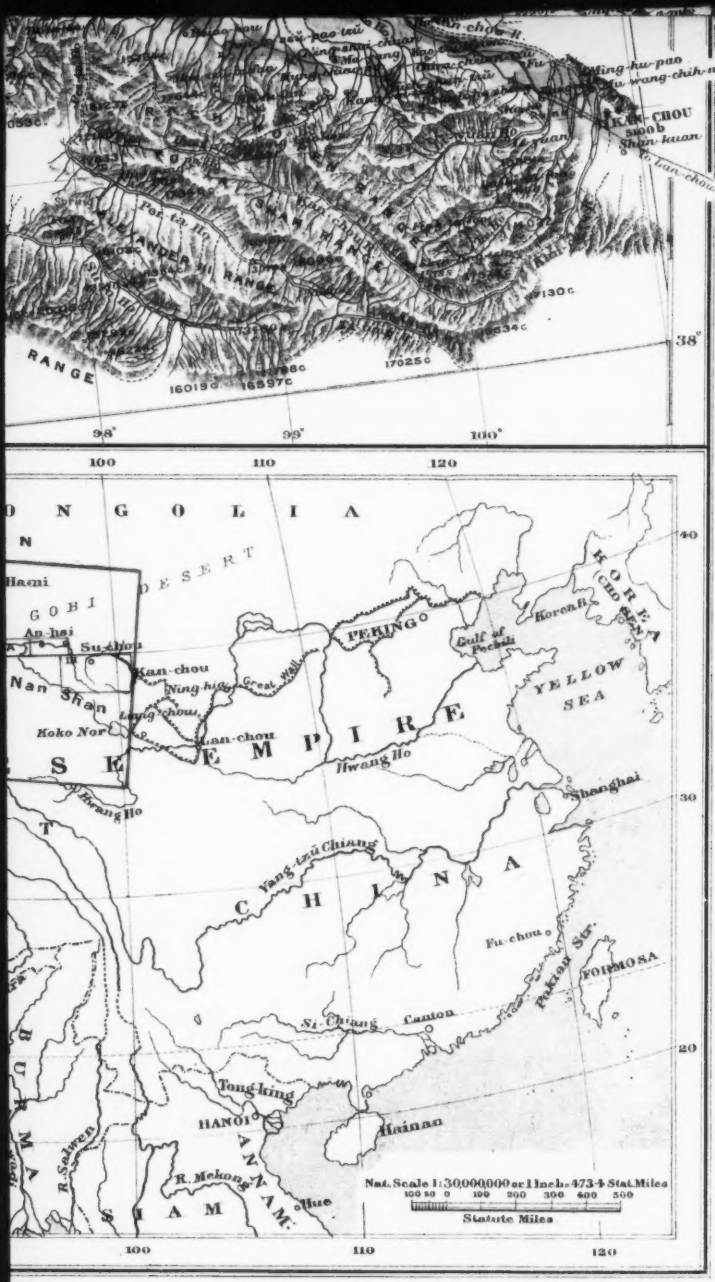
Heights in feet.

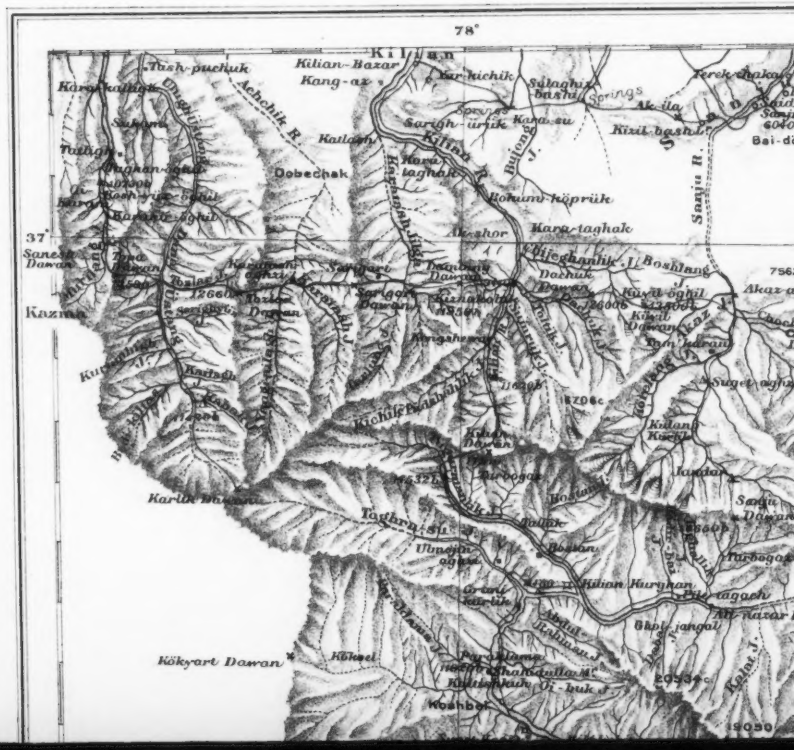
ically	⊕	Camp	△
ght	△12000	Sacred tomb	⊼
	7790b.	Ancient site	⊏
	9508c.	Ancient frontier wall	
	Dark Green	Frontier wall extant	
ungle	Light Green	Ruined mound	
	Yellow	Ruined watch tower	⊞
		Route traversed	

rning the surveys from which the originals of
ve been constructed, together with a list of
termined latitudes, is given in his note
Geographical Journal for March, 1911.

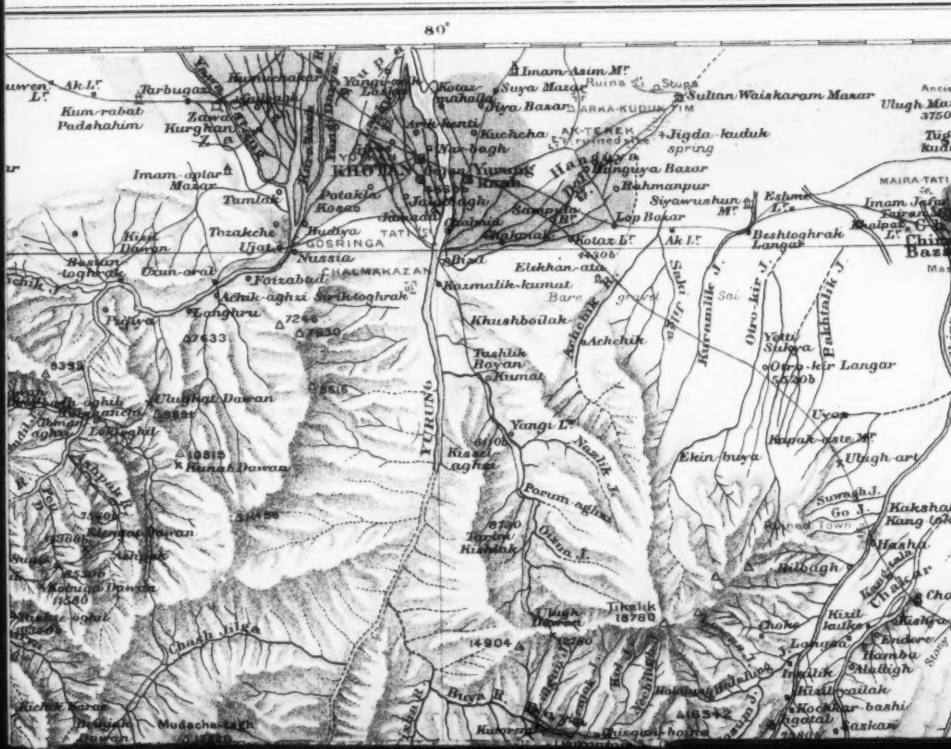
90° 91° 92° 93°


Low ridges
Kashkar Pass
P'in-tai-ts'un
17056C.
SUESS RANGE
95°
96°
70
80
90
40
30
20
TURKESTAN
Samarkand
Amu Darya
Balkho
AFGHANISTAN
RABULo
Chitral
Dir
Peshawar
Srinagar
Leh
Issik Kul
Kuchar
Turfan
Hami
Kashgar
R. Tarim
Yarkand
Khotan
Lop Nor
Charchan
Altin Tagh
Nan Shan
Koko Nor
CHINESE
TIBET
Quetta
BALUCHISTAN
R. Indus
R. Sutlej
LAHORE
DELHI
HIMALAYA MOUNTS
NEPAL
BHUTAN
Ibasa
Tsanpo
Brahmaputra
Karachi
Tropic of Cancer
R. Ganges
INDIA
BOMBAY
CALCUTTA
Goa
BURMA
R. Salween
Irrawadi


Tsung-ling
Kuen-lun
Pe-shan
Ta-ho-shan
Ta-ho-shan
Ta-ho


78°
37°
Kilian-Bazar
Kang-az
Tash-puchuk
Karaul-tallak
Achchik R.
Kallam
Dobechak
Kilian R.
Bulung
Sarigh-urik
Kang-su
Karkichik
Salughur Bashi
Springs
Kizil-bashi
Sanju R.
Bai-di
Kizil-agil
Kara-taghak
Akshor
Kaz-mazar
Kaz-mazar R.
Kaz-mazar Dawan
Kichik Kaz-mazar
Kichik Kaz-mazar R.
Kaz-mazar Dawan
Kaz-mazar
Kara-tash R.
Kara-tash
Kara-tash Dawan
Kara-tash Dawan
Kara-tash
Kara-tash R.
Kara-tash

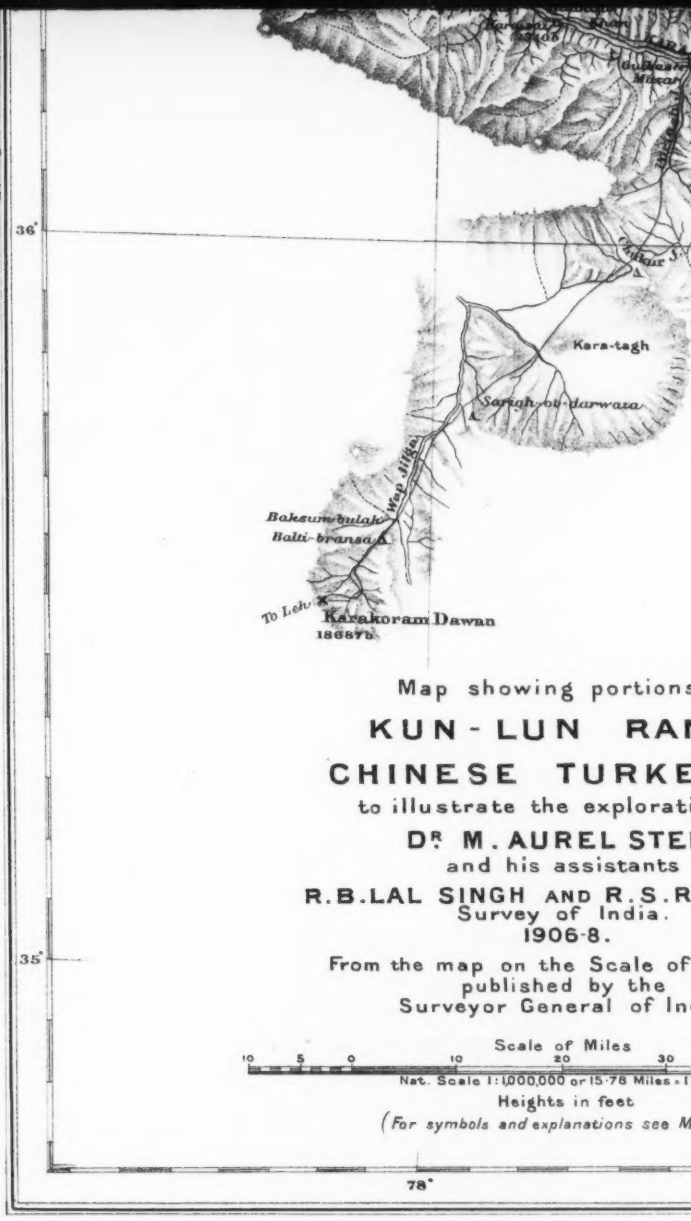
79°
Baskak
Imany
Ali Akbar M.
Dombak
Abdulla or
Sanju Bazar
6040b
Bai-dobe
Puski R.
Puski J.
Kochkar-bashi
Kök boinak
Dawan
Duwa R.
Odek-bashi
Takhtuwen L.
Ak L.
Lamus-kir
Lamus
Kum-rabat
Padshahim
Duwa Bazar
& Jaibagh Mazar
Sanjagiz
Hasa Hill
Tushkan-tokai
Ichchik
Bezdan-toghrak
Akar-aghzi
Zok-bash
Zok-tokai
Kochkar-Dawan
Roskam
Kichik-Dawan
Bezdan
Kara-otash M.
Arpalik
Saima-aghzi
Yar-yut
Duwa-akan
Hawukang
Kichik-yaldagh
Chakir J.
Kara-tash R.
Sanju-Dawan
Kara-kash R.
Shumbe-aghil
Yaurat
Yaurat-Dawan
Sarigh-tiz
Dawan
Kichik Yaruz
Dawan
Ak-tash
Dawan
Ak-tash R.
Kichik Yaruz
Dawan
Kara-kash R.
Kara-kash J.
Kara-kash J.
Kara-kash J


80°
Imam-Asim M.
Ruins
Stupa
Sultan Waiskaram Mazar
Suya Mazar
Kotaz mahalla
Suya Bazar
ARKA-KURUK-TIM
AK-TENEK
ruined site
Jigda kuduk
spring
Kuchcha
Yangi Lay
Arik-kenti
Yangi-arik
Yangi-arik R.
Yurung Kash R.
Kara-kash R.
Kara-kash
Yurung Kash
KHOTAN
Yurung
Hanguya
Hanguya Bazar
Rahmanpur
Siyawushun M.
Eshme L.
Imam-Jafar Mazar
Imam-aptar Mazar
Tamlak
Potakla Kosab
Jakarlagh
Kalma
Sampula
Lop Bakar
Kotaz L.
Ak L.
Beshtoghrak Langar
Tirakche
Ujgak
Hudiya
GOSRINGA
TATI
Nussia
Faizabad
HALMAKAZAN
Elekhan-ata
Razmalik-kumat
Bare
Achik-aghzi Sir-ktoghrak
Langaru
Khushboidak
Achchik
Yatu Sukya
Oyro-kir Langar
Tashlik Bayan Kumat
Yangi L.
Kiasel aghzi
Porum-aghzi
Ekin-muya
Kapak-kate M.
Ulugh-art
Suwagh J.
Go J.
Hashq
Kilbugh
Kizil-kulkey
Choka
Langaza
Tikelik 18780
Tikelik Dawan
14904
Chagh-jilga
Buya R.
Kuruk-kash R.
Yasnik
Hollowed Hillocks
Kochkar-bashi
Kaskar
Mudacha-tagh
Kichik-Karaul
Ak-tagh
Kum-rabat Padshahim
Zawat Kurghan
Kara-kash
Yurung Kash
Kara-kash R.
Yurung Kash R.
Yangi-arik R.
Kotaz-mahalla
Suya Bazar
Arik-kenti
Kuchcha
Yangi Lay
Yurung
Kash
Jakarlagh
Kalma
Sampula
Lop Bakar
Kotaz L.
Ak L.
Beshtoghrak Langar
Eshme L.
Siyawushun M.
Rahmanpur
Hanguya Bazar
Hanguya
Yurung Kash
Kara-kash
Kara-kash R.
Yangi-arik R.
Yangi-arik

Ancient Fort
Ulugh Mazar
3750b
Old Domoko (Desert)
FARHAD-BEG-YAILAK
Yoghan-togh
4540b
Tuge
Kuduk
Lachin-ata Mt.
BALAWASTE
Malakulagan
KHAGALIK
DARABZAN
DONG
Shakiin-yailak
4510b
Saghizlik-yailak
KIZIL-KUM
KERIYA R.
Shirul R.
Ilak Barakir R.
Achma Bazar
Hassan
Laisu
Bostan
Kara-kir L.
Kalmak Mt.
Shivuk L.
Pondru
Yaka L.
Okkal-ighil
Tag Langar
Chira R.
Akin-bujt
4430b
Dashman
Yaii-tingluk
Yol-arish
Yangi
Sharike
Kone-bagh
Toghrak L.
Laika
Kizmak-kum
Bash-kurghan
Yol-arish
Tushkakik Chap
Khaja Takab
Dash
Genju R.
Kakshaltik
Kang-lokal
Chakar
Yulchun L.
Sai with low scrub
Achma
Karadoba
Nura R.
Kolchusun R.
Aralik R.
Kirtash R.
Arkesar
7360b
Hoh Mt.

II.

82°
37°
Yoghan-toghrak-yailak
4540b
KIZIL-KUM
Baghjigde
KERIYA R.
Saghizlik-yailak
4510b
Hassan-atim
Bostan
Pondra
Keriya
Ghadghan
Ara-üstang
Ot toghrak
Yol-arish
Yes-yulghun R.
Yesil-tungluk
Yangi-arik
Sharike
Toghrak L.
Laika
Bash-kurghan
Kapa
6526
Achchan Sai
Pishkia Sai
Aksaikit Sai
Yaghlyk Sai
Aksaikit Sai
Karabulak
Ghorabulak
Pishkia
11053
12885
11505
16748
8807 ft.
8864 ft.
Achchan
Chap
Bayakan Mt.
79000
Kara-kol Sai



Map showing portions

KUN-LUN RA

CHINESE TURKE

to illustrate the explorati

Dr M. AUREL STE

and his assistants

R.B.LAL SINGH AND R.S.R

Survey of India.

1906-8.

From the map on the Scale of

published by the

Surveyor General of In

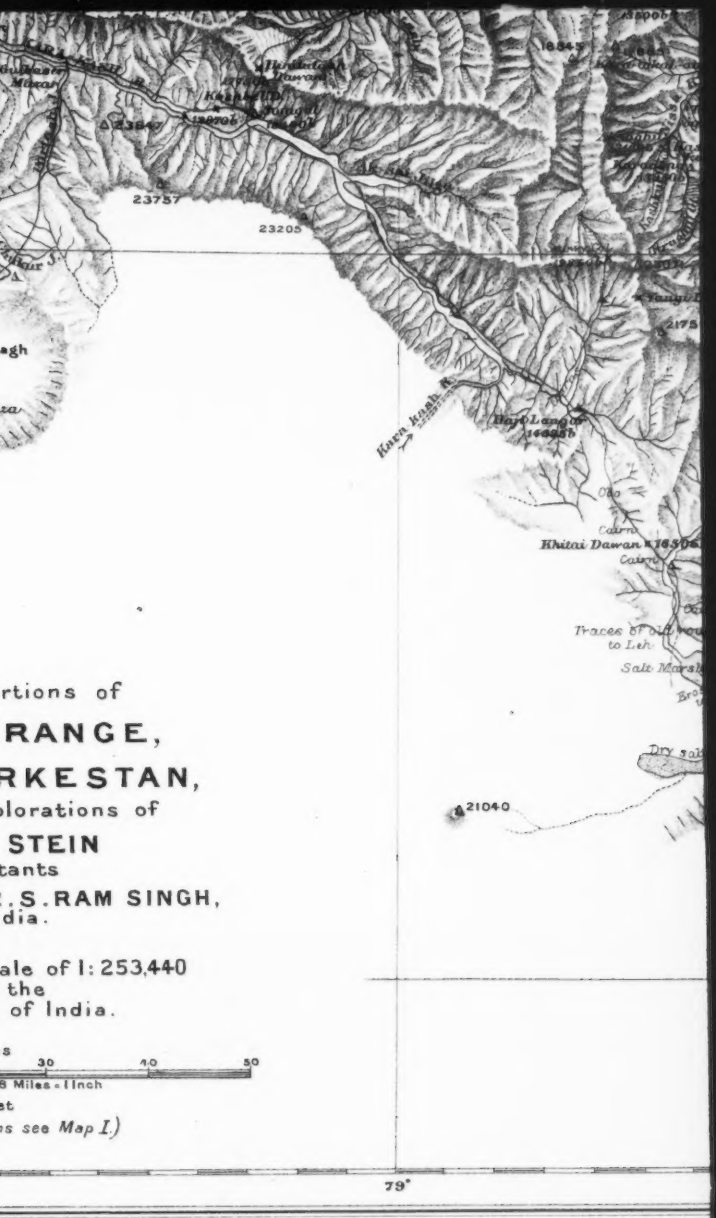
Scale of Miles

10 5 0 10 20 30

Nat. Scale 1:1,000,000 or 15·78 Miles =

Heights in feet

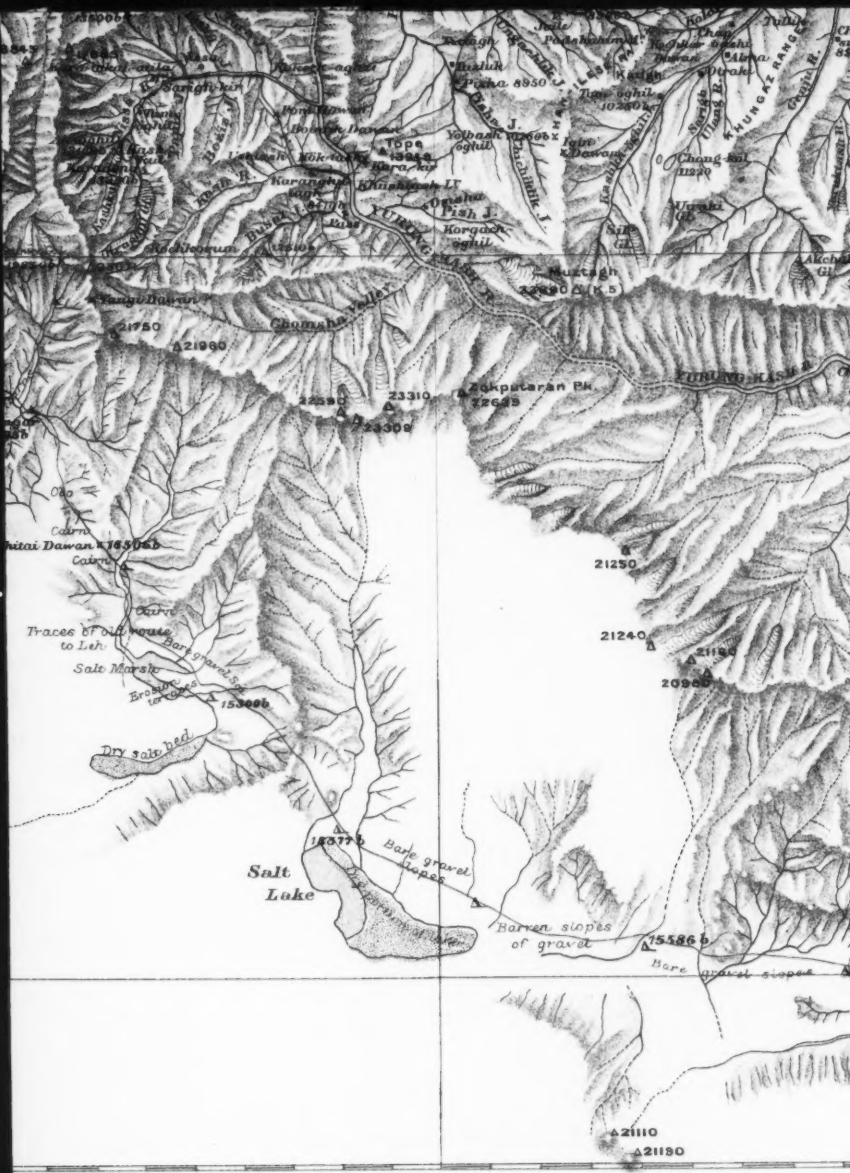
(For symbols and explanations see M



rtions of
RANGE,
RKESTAN,
olorations of
STEIN
tants
.S.RAM SINGH,
dia.

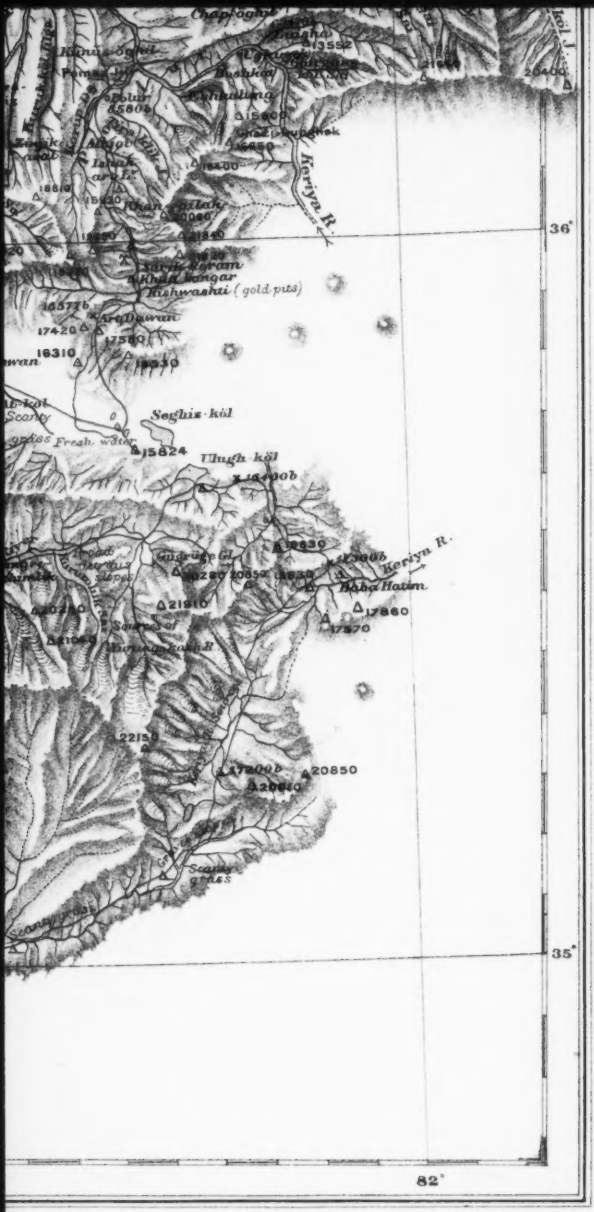
ale of 1: 253,440
the
of India.

30 40 50
8 Miles = 1 Inch
et
s see Map I.)



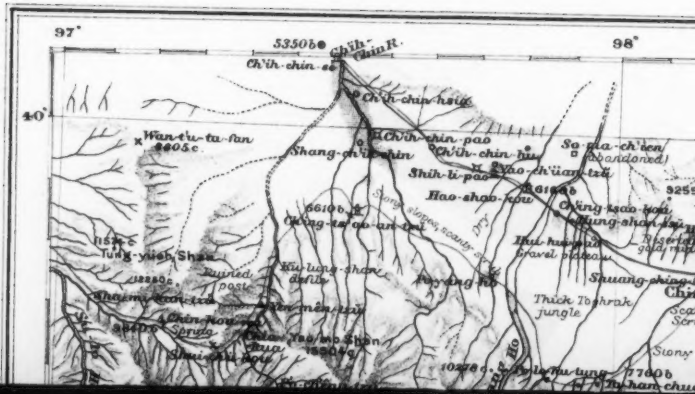
Published by the Royal Geographical Society

Badoghan
Yazgulam
Chatash
Sarykol R.
Domsun
Khaja Kashuddin
Zailik
Kizilkhach
Kuldak Dawan
Ak-tal
Scarce
Fresh water
Night-camp
Kamdo
Kamdo Dawan
Grave Hope
L. Lighten
81°

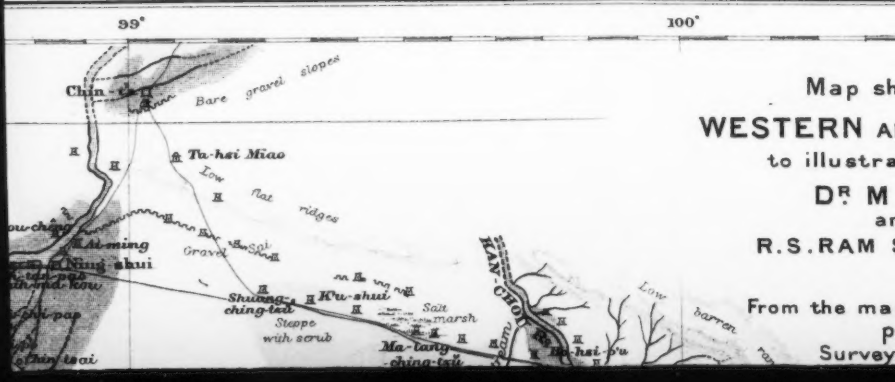


CHINESE TURKESTAN

STEIN.


97°
98°
40'
5350b
Ch'ih-chin R.
Ch'ih-chin ssŭ
Ch'ih-chin hsüe
Ch'ih-chin pao
Ch'ih-chin hsü
Shang-ch'ih-chin
Shih-li pao
Yao-ch'üan-tzŭ
Hao-shao-kou
Wan-t'u-ta-fan
2605c
6610b
Ch'ing-tzŭ-ao-ni-kou
Tung-yieh Shan
15575
Yurnied post
Ku-lung-shan defile
Ch'in-men-tzŭ
Chia Yao mo Shan
15504c
Ch'in-kou Spruce
Shui-chi kou
Stony, stony, boundary
Thick Tolhrak jungle
Shuang-shing
Ch'
Sca
Sor
Stony
10276
S. Ch'ih-chin-hu-tung
7700b
Ta-han-chu

Huang-tsao-ying
Yeh-ma-wan
Stony Steppe
Hsin-ch'eng-tzŭ
An-yüan-kou
Dunes
Hsia-kou-ch'ien
Pei-ta-Ho
Chia-yu-kuan
Scanty Scrub
Tao-lo-ho
Stony steppe
SU-CHOU
Chin-ch'uan
Ta-ying-p'an
San-ch'a-ho
Ch'in-tsai
Yü-men-kuan
Ch'ang-ma-t'ien
Ch'ang-shou-t'ien
Ch'ang-ma-t'ien
Ch'ang-shou-t'ien
Yü-men-kuan


99°
100°
Bare gravel slopes
Ta-hsi Miao
Low flat ridges
Gravel
Ning-shui
Shuang-ching-tzŭ
Steppe with scrub
Hsi-shui
Salt marsh
Ma-tang-ching-tzŭ
HAN-CHOU
Low barren
Map sh
WESTERN A
to illustra
DR M
a
R.S.RAM
From the ma
p
Survey

III.

101°

ap showing portions of the

40°

RN AND CENTRAL NAN-SHAN

ustrate the explorations of

DR M. AUREL STEIN

and his assistant

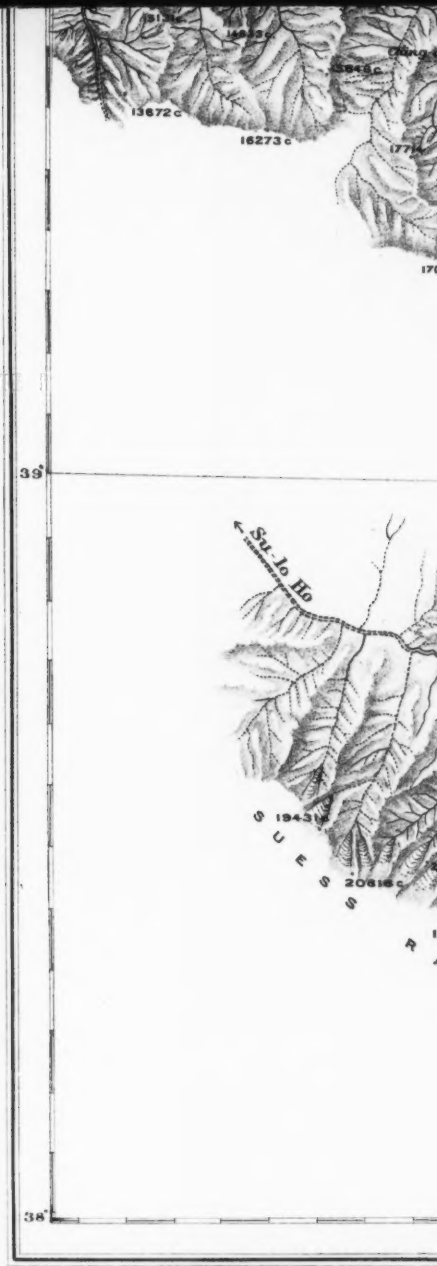
RAM SINGH, SURVEY OF INDIA.

1907..

he map on the Scale of 1: 253,440.

published by the

Surveyor General of India.


13672c
16273c
39°
Sui-Jo Ho
19431c
20618c
38°
10 5 0 10
Nat. Scale

Yin-yai
Ko-chia-yai-tou
Shih-hui-yao
Shih-hui-yao
Hsiao-kou
Saü-yu-kou
Hung-shan
Hung-shan
Kuei
Pei-ta Ho
Pei-ta Ho
Hsiao-shih-pa Ho
Hsiao-shih-pa Ho
Grassy steppe without water
Pei-ta Ho
Su-lo Ho
Su-lo Ho
Sand-covered plain
Small lake
Dunes
RANGE
RANGE
RANGE
98°
Scale of Miles.
10
20
30
40
50
Scale 1:1,000,000 or 15·78 Miles = 1 Inch.
Published by th

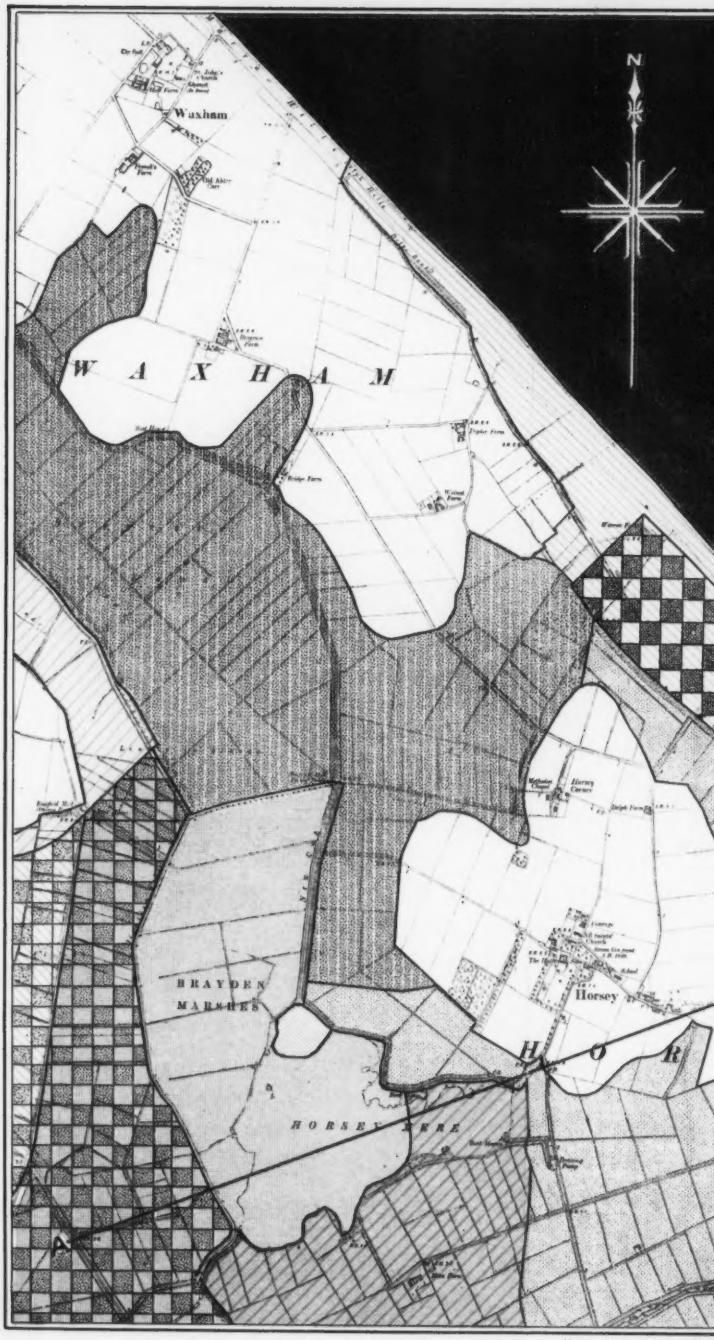
d by the Royal Geographical Society

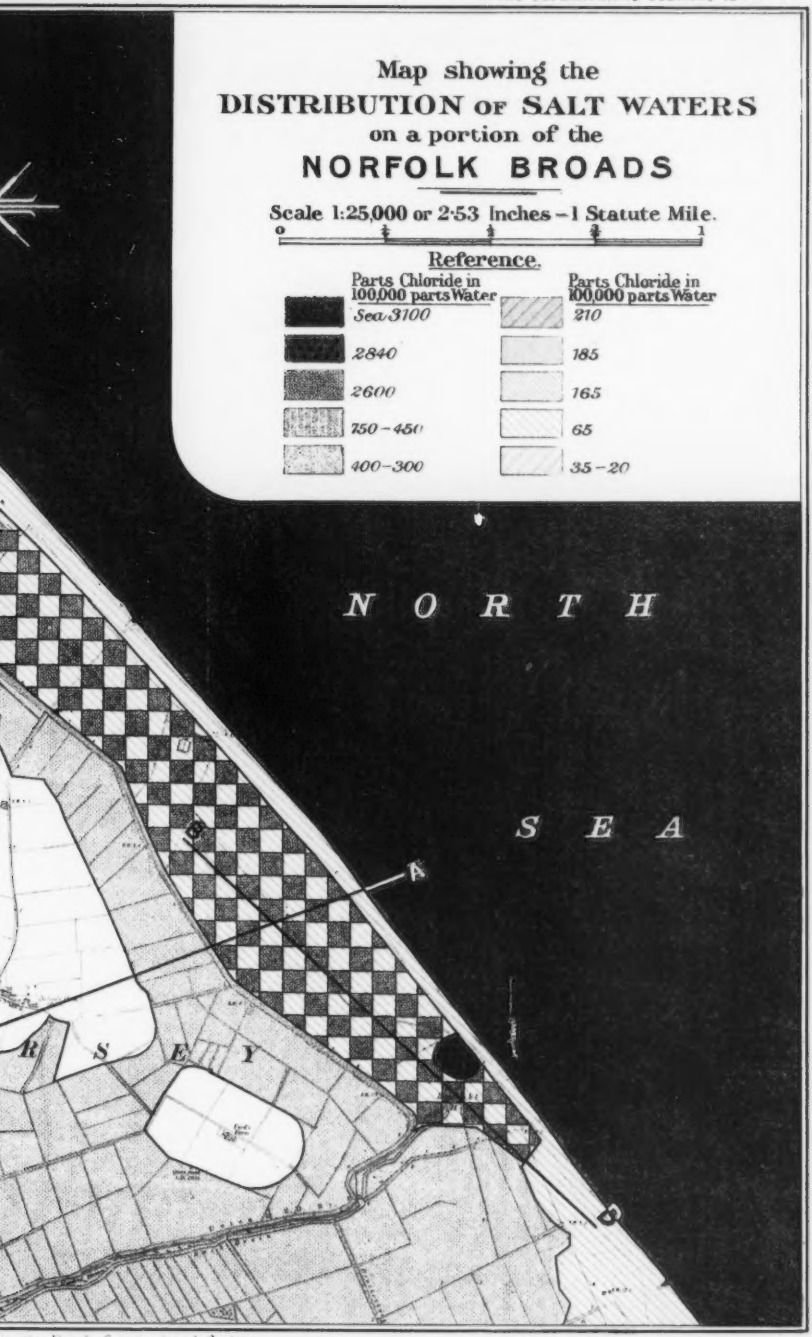
Heights in feet

(For symbols and explanations see Map I.)

WESTERN AND CENTRAL NAN-SHAN

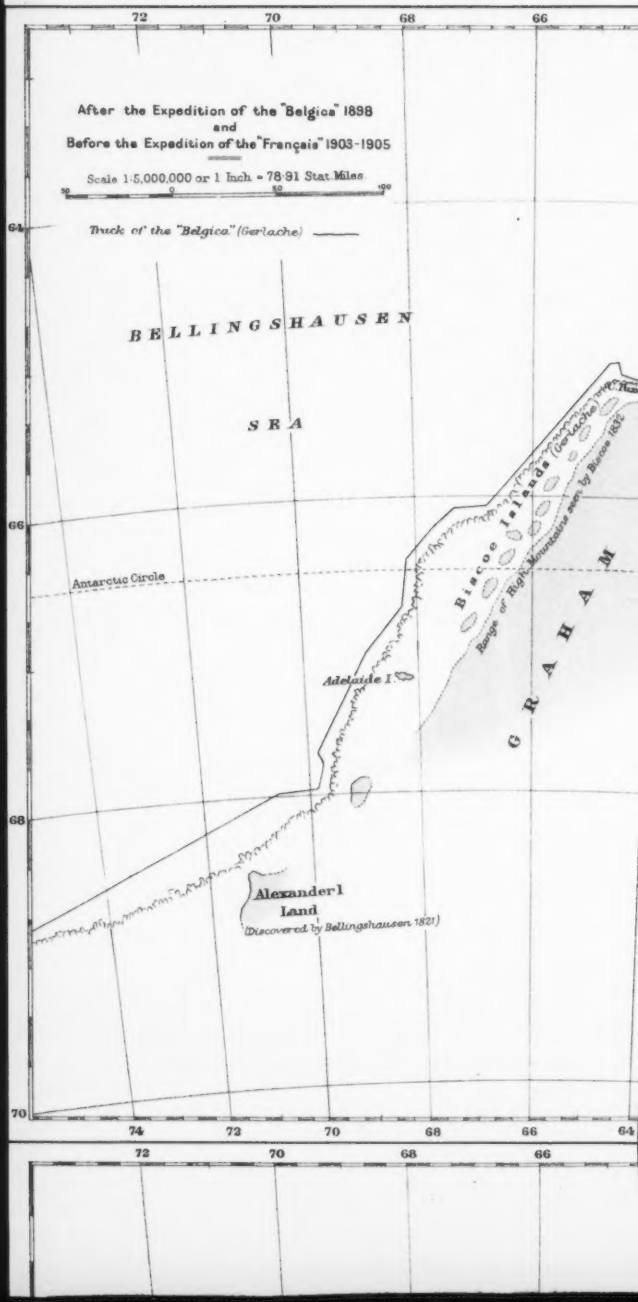
STEIN.


N
Waxham
WAXHAM
BRAYDEN MARSHES
HORSEY MERE
Horsey
HORSEY

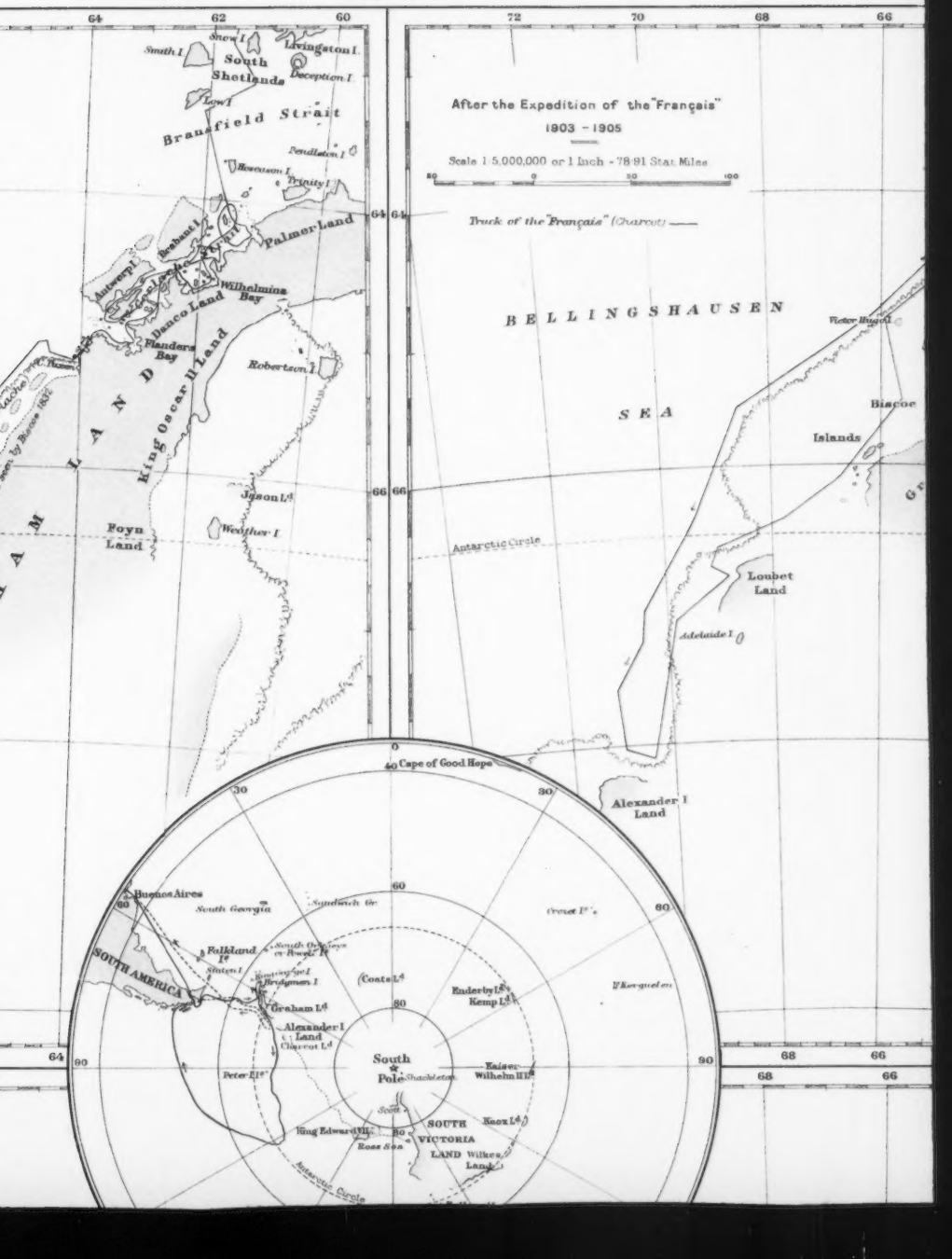


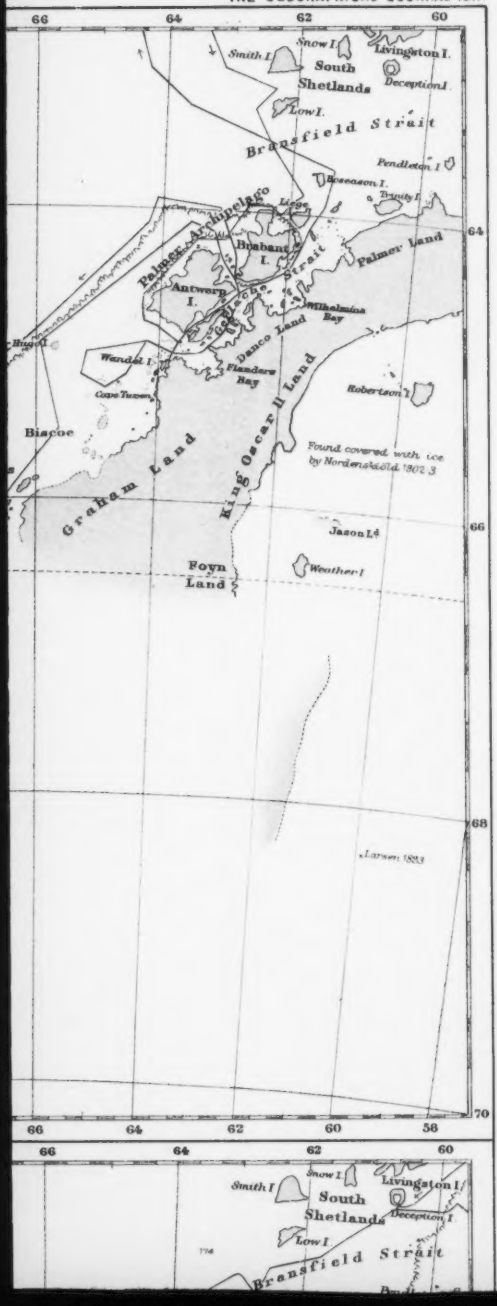
by the Royal Geographical Society

NORFOLK BROADS
Pallis.

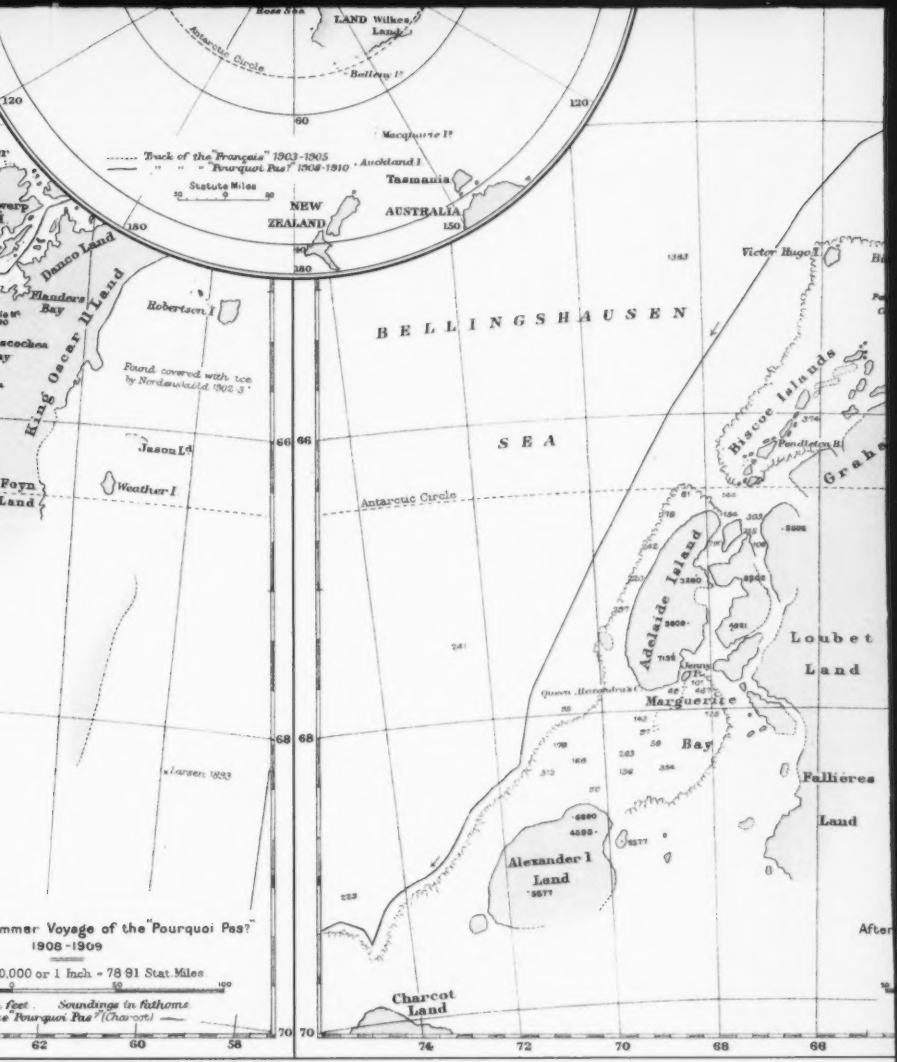

After the Expedition of the "Belgica" 1898
and
Before the Expedition of the "Français" 1903-1905
Scale 1:5,000,000 or 1 Inch = 78·91 Stat. Miles
50 0 50 100
Track of the "Belgica" (Gerlache)
BELLINGSHAUSEN
SEA
Antarctic Circle
Adelaide I.
Biscoe Islands (Gerlache)
Range of High Mountains seen by Biscoe 1831
GRAHAM
Alexander I Land
(Discovered by Bellingshausen 1821)
72
70
68
66
64
74
72
70
68
66
64
72
70
68
66

Maps to illustrate the paper by
Dr J. B. CHARCOT
on the
FRENCH ANTARCTIC EXPEDITION.
1908 - 1910.




66
64
62
60
Snow I.
Livingston I.
Smith I.
South Shetlands
Deception I.
Low I.
Bransfield Strait
Pendleton I.
Boreason I.
Trinity I.
Lizard
Palmer Archipelago
Brabant I.
Antwerp I.
Gerlache Strait
Palmer Land
Wilhelmina Bay
Danco Land
Wendel I.
Flanders Bay
Cape Tuxen
Biscoe
Graham Land
King Oscar II Land
Robertson I.
Found covered with ice by Nordenskiöld, 1902-3
Jason Id.
Weather I.
Foyn Land
Larsen 1893
64
66
68
70

Palmer Archipelago
Antwerp I.
Frenchman Hill I.
Mt. William
Victor Hugo
Bismarck Str.
Wandel I.
Peterman I.
Cape Tuxen
Flanders Bay
Beascochea Bay
BELLINGSHAUSEN SEA
Biscoe Islands
Graham Land
King Oscar
Foyn Land
Antarctic Circle
Adelaide Island
Loubet Land
Marguerite Bay
Fallieres Land
Alexander I Land
After the 1st Summer Voy
1908 -
Scale 1 5,000,000 or 1
Heights in feet
Track of the Pourquoi
64
66
68
70
74
72
70
68
66
64
62



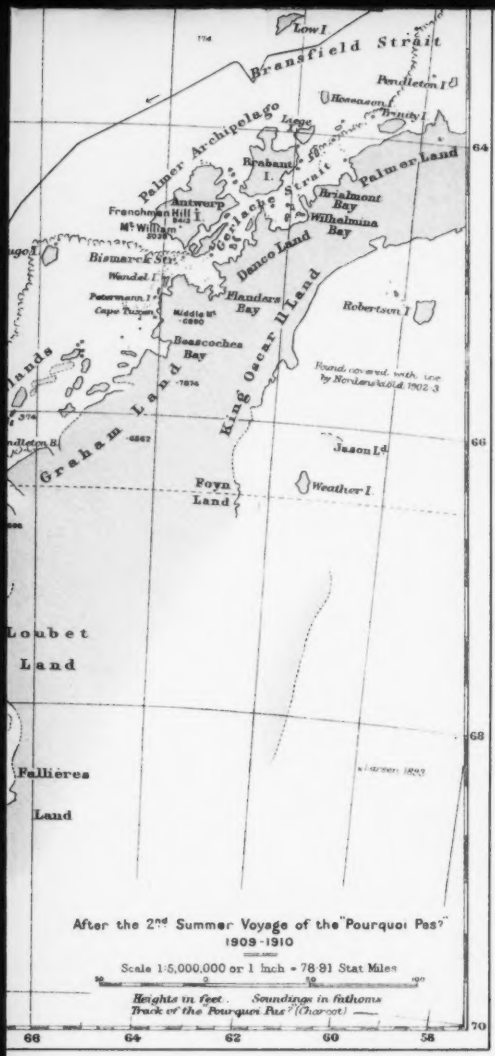
mmer Voyage of the "Pourquoi Pas?"
1908-1909

0,000 or 1 Inch = 78·91 Stat. Miles

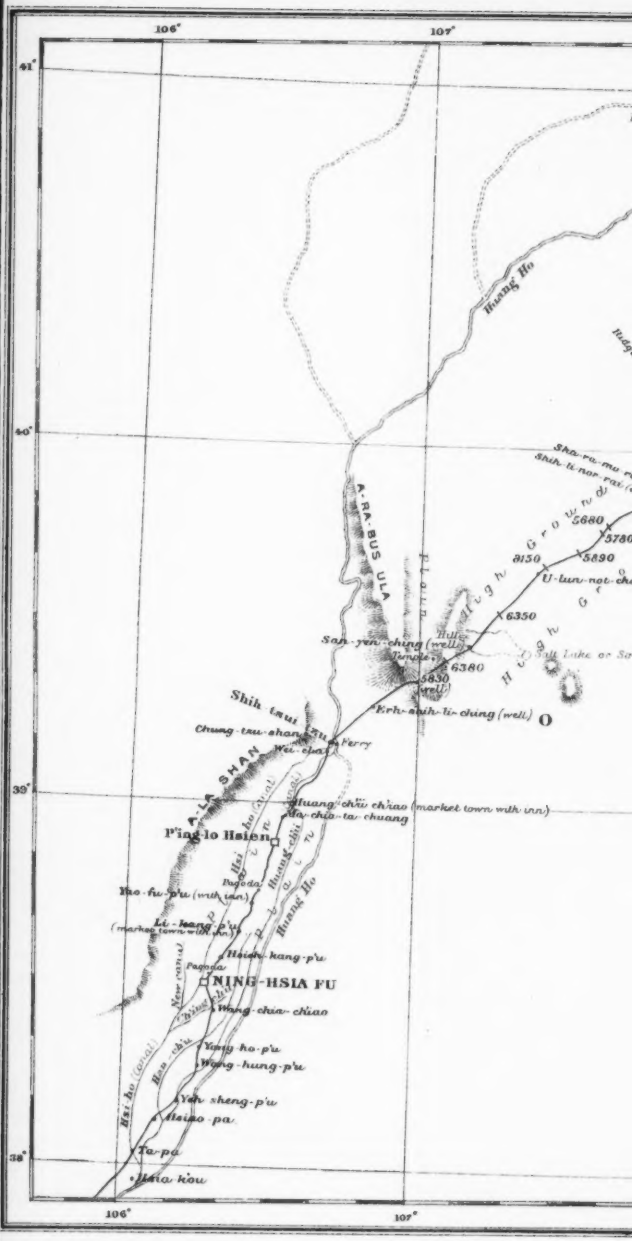
0 50 100

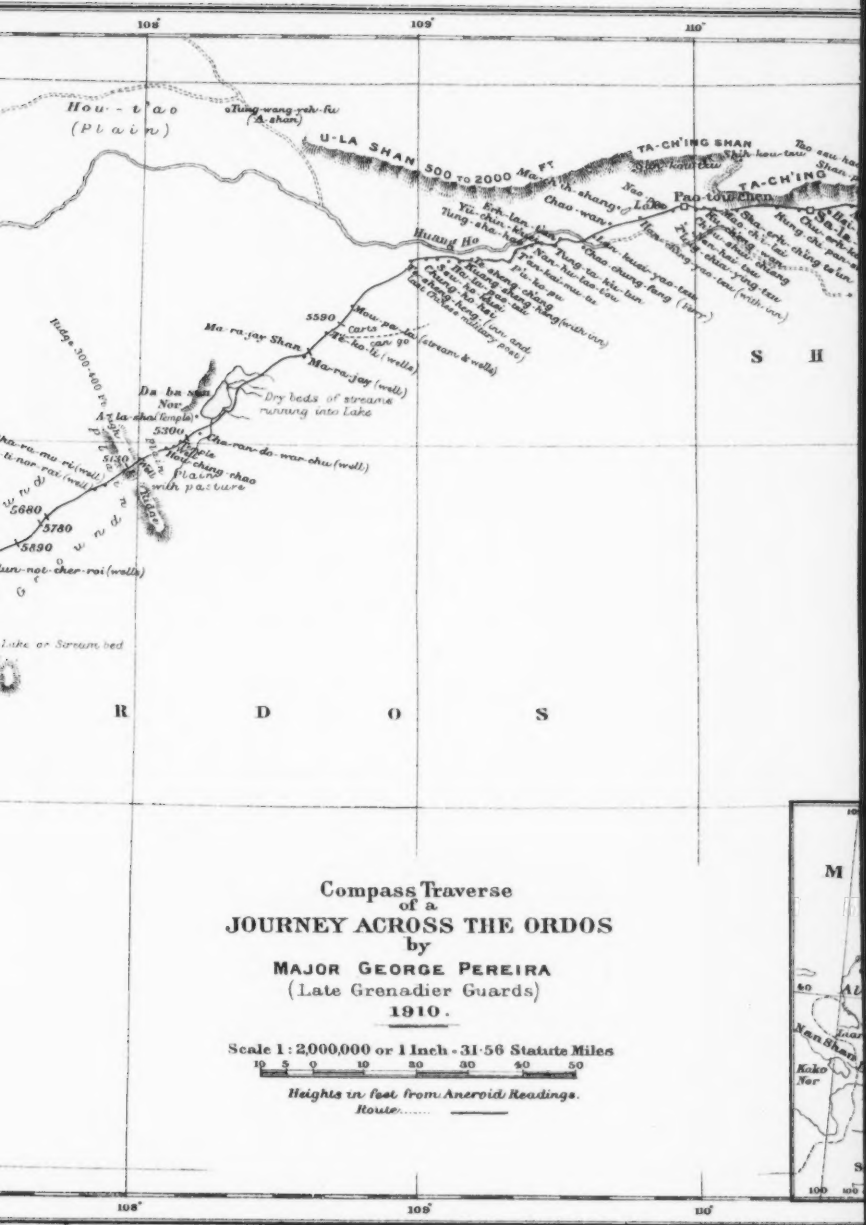
feet. Soundings in fathoms
e Pourquoi Pas? (Charcot)

Published by the Royal Geographical Society



ANTARCTIC
Charcot.


106°
107°
41°
40°
39°
38°
Huang Ho
A-RA-BUS ULA
Plateau
Shih-tsui
Chung-tsu-shan
Ferry
Wei-chai
Erh-shih-li-ching (well)
Huang-chiu ch'iao (market town with inn.)
Ta-chia-ta-chuang
P'ing-lo Hsien
Ho-fu-p'u (with inn.)
Li-kang-p'u
(market town with inn.)
Hsieh-kang-p'u
Pagoda
NING-HSIA FU
Pagoda
Wang-chia-chiao
Yang-ho-p'u
Wang-hung-p'u
Yen-sheng-p'u
Hsiao-pa
Ta-pa
Hsia-kou
Great Wall
Hsi-ho (canal)
Hsin-ho (canal)
Hsin-ho (canal)
Hsi-ho (canal)
Huang Ho
Huang Ho
Shih-li-nan-ts'ai
5680
5786
5890
6150
6350
6380
5830
well
Hills
Pagoda
Dry Lake or Sa
U-lun-not-ch
Gravel Ground
Gravel Ground



Compass Traverse
of a
JOURNEY ACROSS THE ORDOS
by
MAJOR GEORGE PEREIRA
(Late Grenadier Guards)
1910.

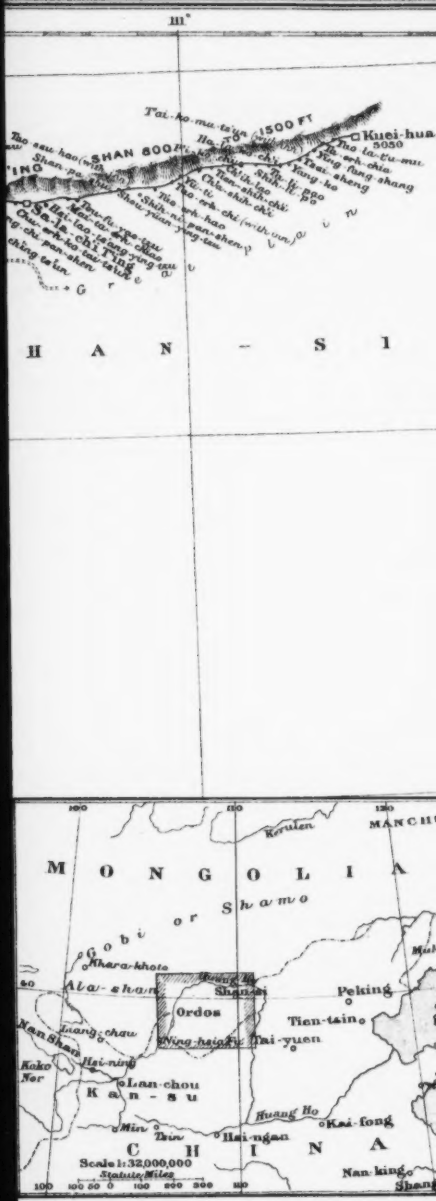
Scale 1 : 2,000,000 or 1 Inch = 31·56 Statute Miles

10 5 0 10 20 30 40 50

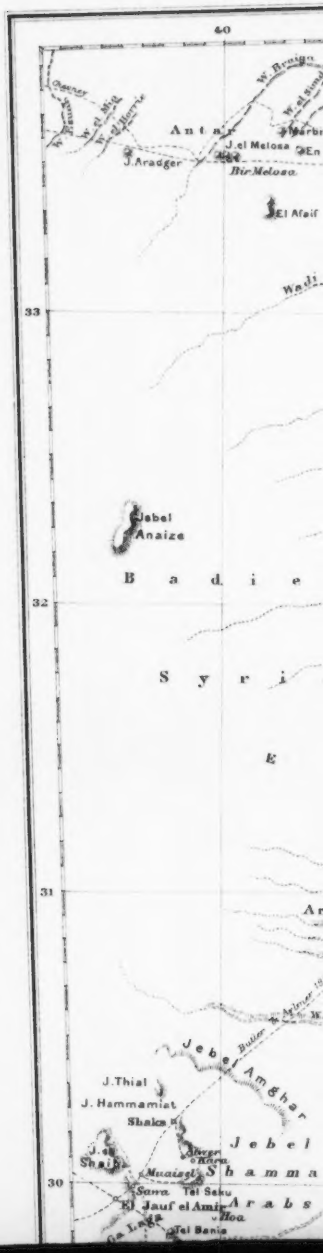
Heights in feet from Aneroid Readings.

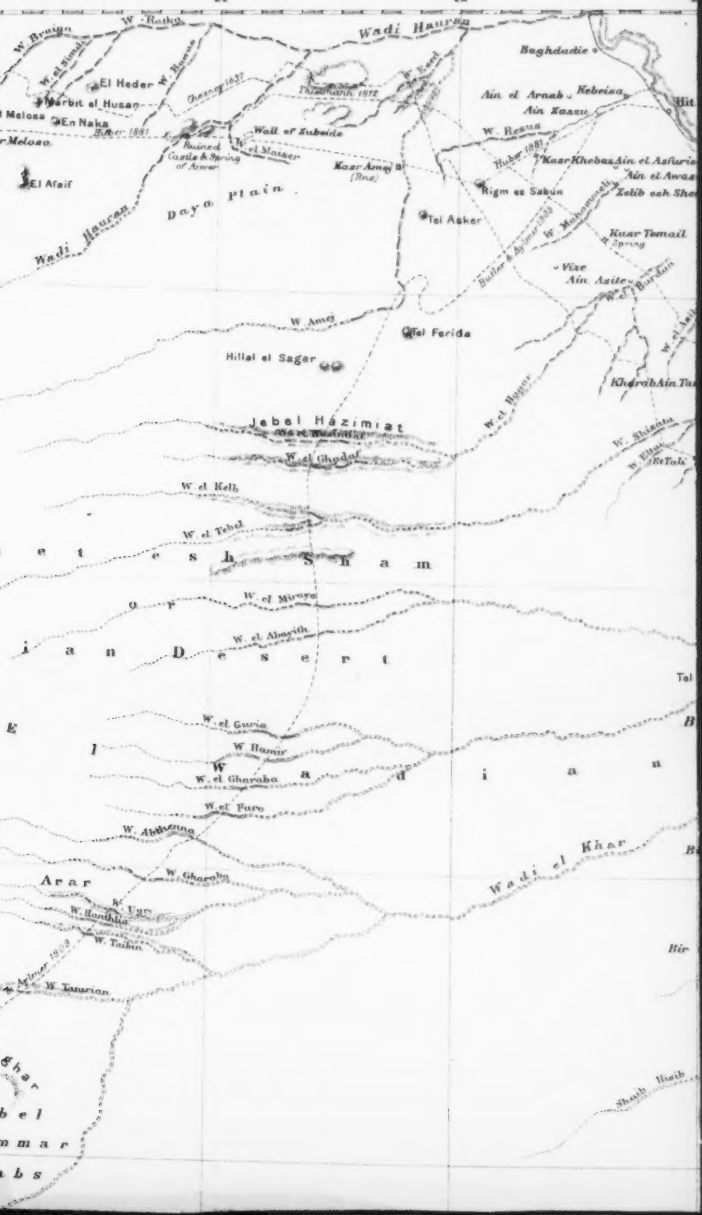
Route.....

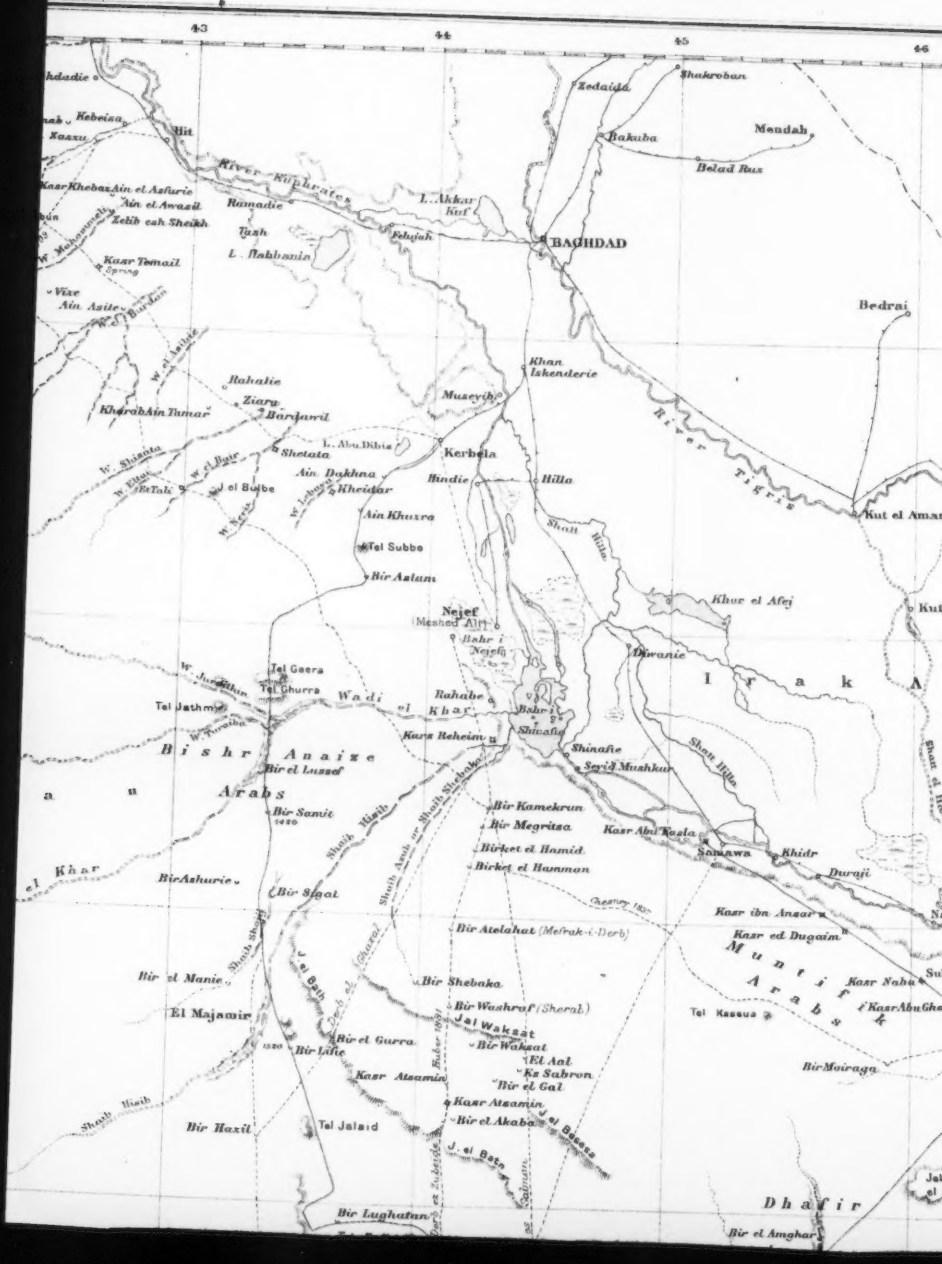
Published by the Royal Geographical Society


111°
T'ai-ho-mu-ta'yn 11500 FT
Kuei-hua
5050
SHAN 600 m
'ING
H A N - S I
MONGOLIA
Gobi or Shamo
Khara-khoto
Ala-shan
Ordos
Peking
Tien-tsin
Nan Shan
Hai-ning
Koko Nor
Lan-chou
K a n - s u
Huang Ho
Kai-fong
C H I N A
Nan-king
Scale 1:32,000,000
Statute Miles
100 50 0 100 200 300

ORDOS
PEREIRA


40
33
32
31
30
Jebel Anaize
B a d i e
S y r i
E
Jebel Amghar
J. Thial
J. Hammamiat
Shaiba
Jebel
Muaisgi
Sh a mma
Sara
Tel Saku
El Jauf el Amir
Arabs
Tel Bania
J. el Melosa
J. Aradger
Bir Meloso
El Afaif


41
42
Wadi Hauran
Baghdadie
Ain el Arnab
Kebrisa
Ain Kasau
W. Rasua
Kasr Khebas
Ain el Asturia
Ain el Awas
Zelib esh Sha
Rigm es Sabun
Tel Asker
Kasr Tumail
Spring
Vize
Ain Asile
Kasr Amej
(Tine)
Wall of Zubeide
Ruined Castle & Spring of Anwar
Well of Water
Daya plain
El Afaif
El Heder
Serbit el Husan
En Naka
Meloasa
Tel Ferida
Hillal el Sagar
W. Amej
Jebel Házimiat
W. el Ghydal
W. el Kelb
W. el Tebel
W. el Mirora
W. el Abuith
W. el Guria
W. Hamir
W. el Gharaba
W. el Fure
W. Abhenna
W. Gharaba
W. Ure
W. Tubun
W. Tamrian
W. el Khar
Arar
Tel
Bir
Shaib Hish
Desert


43
44
45
46
Zedaida
Shakroban
Rakuba
Mendah
Belad Rus
River Euphrates
Ramadie
Fehjah
BAGHDAD
Bedrai
Khan Iskenderie
Museyibjo
Rahalie
Ziara
Barijawid
Kerbela
Hindie
Hilla
River Tigris
Kut el Amar
Shatt Hilla
Khor el Afej
Nejef
Meshed Ali
Bahr i Nejef
Diwanie
I r a k A
Tel Geera
Tel Ghurra
Tel Jathmie
Wadi el Khar
Rahaba
Kasr Reheim
Shinafie
Seyid Mushkur
Bishr Anaize
Bir el Lussef
Arabs
Bir Samit
Bir Kamekrun
Bir Megritsa
Kasr Abd Kesla
Samawa
Khidr
Duraji
Birket el Hamid
Birket el Hanman
Bir Ashurie
Bir Shaal
Bir Atelahat (Mefrak-i-Derb)
Kasr ibn Ansar
Kasr ed Dugaim
Bir el Manie
Bir Shebaka
Bir Woshrof (Sheral)
El Majamir
Jal Waksat
Bir el Gurra
Bir Lafit
El Aal
Kasr Atsamin
Kasr Sabron
Bir el Gal
Bir Haxil
Tel Jalaid
Bir el Akaba
Bir Lughatnn
Dhafir
Bir el Amghar
Bir Mairaga
Tel Kassus

Map of NORTH EAST ARABIA showing the routes of CAPT. G. E. LEACHMAN. (The Royal Sussex Regt.) 1910. and other explorers.

Scale 1:2,500,000 or 1 Inch = 39·46 Statute Miles.

10 5 0 10 20 30 40 50 60 70

Reference.

Ain	Spring	Kasr	Castle	
Bahr	Lake	Shaib	Ravine with occasional stream	
Bir	Well	Shatt	River (Arabic)	
Birket	Cistern	Tel	Mound	
Felk	Horseshoe Pits	Wadi	Ravine or stream bed usually dry	
Jebel	Mountains	Telegraphs		

Capt. G. E. Leachmans route 1910

Other routes

Heights in Feet.

Ut el Amara
Kut el Hai
Amara
Kale Sale
Shustar 410
Ahwaz 220
PERSIA
Arabi
Shatt el Hai
River Karun
Khor el Kelam
Hamar
Harna
Chabaish
Medina
Nasrie
Suk esh Sheyuk
Lake Hamar
River Euphrates
Khamasia
Canal 1837
Kasr Bir Shagra
BUSRA
Shatt ul Arab
Muhammera
Zobeir
Raftie
Seihan
Jebal el Hanie
J. Sinam
Safwan
Um Kasr
Fao Fort
Khor Abdulla
Halaiba
Himmar
Bir Gishania
Ridges
J. Jarishan
33
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Shaiba
Shammar
Arabs
Sawa
Tel Saku
El Jauf el Amir
Hoa
Tel Banie
Shekik
Tel Um Sedais
Wanwa
Kolekhia
Tel Emteris
Rigm el Mesbeil
J. Tawil
El Faluja
El Rekad
Tel Burk
Felk Alaima
3550
El Ukatia
El Ukatia
Nefud
J. el Abrak
Felk Smaia
El Hanefia
Hoa Fedaka
Felk Baida
El Maneckbia
El Metrania
2400
Kasr Hajrania
El Hesnia
2240
Jubba
3060
Huber 1880
J. Um en Selman
J. Rotha
J. el Akheterad
Huber 1863
J. Rote
Twaiz
J. el Khasab
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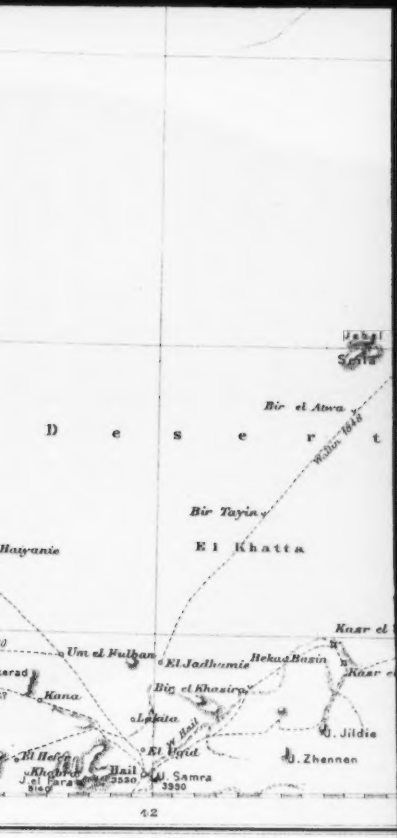
41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D e s e r t
Wadi 1648
Bir Tayin
El Khatta
Hayranie
Kasr el
Um el Hulban
El Jadhumie
Heka Basin
Kasr e
Bir el Khazira
Kana
Lekata
Wadi
El Hofer
El Khaid
D. Jildie
D. Zhennen
Khabra
Hail
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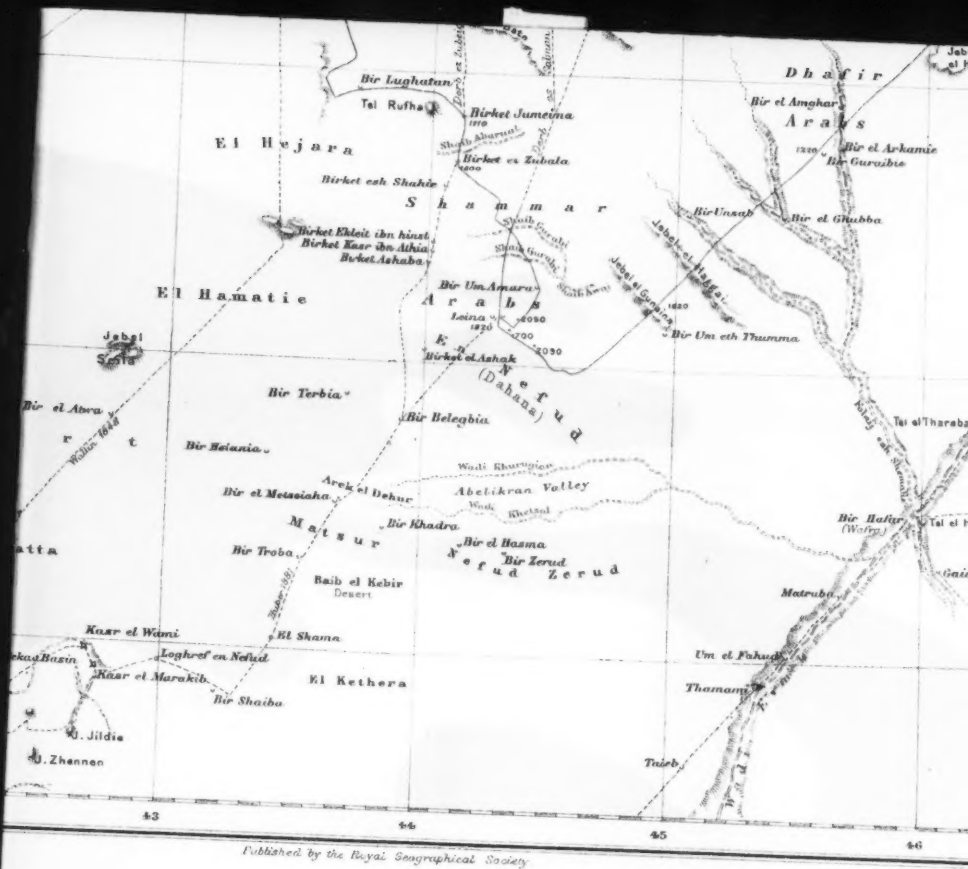
El Samra
3930
Jel Tara
Biet
42



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